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*Maintenance
Section*
PAGES 77-84

electrical contracting



NOVEMBER • 1939

**You're Missing Something
If You Haven't Tried**

THIS NEW G-E TIME SWITCH

BECAUSE it's smaller, simpler, easier to handle, and easier to wire than any general-purpose G-E time switch you've ever seen! It's the new Type T-44.

SMALLER—SIMPLER

This latest addition to our time-switch line is small enough to handle with one hand, yet it has plenty of wiring room for quick, time-saving, profitable installation.

Its sturdy, streamlined case is in keeping with modern design. It can be used either outdoors or indoors, and it is attractive to look at when installed in full view.

SIMPLE CONSTRUCTION — TELECHRON MOTOR

Electric drive is supplied by the well-known Telechron motor—the precision motor of America's best-known electric clocks. Contacts are of silver, conservatively rated at 35 amperes (including Mazda inrush). And because of improvements in time-switch design, the new Type T-44 offers you simpler operation—there are fewer parts, fewer places for trouble.

EASY WIRING

You get a lot of wiring advantages with the new switch, too. Five standard knockouts, plenty of wiring room, clearly indicated connections, side hinges—all these features contribute to a quick wiring job, a profitable installation.

Your nearest G-E office will be glad to supply you with a copy of the descriptive bulletin on this new time switch—Publication GEA-1427K. Or write General Electric, Schenectady, N. Y.



**Type T-44
General-Purpose**

GENERAL  ELECTRIC

440-132

Electrical Contracting, November 1939

why Murray

socket-meter
troughs & cabinets

"HAVE WHAT
IT TAKES!"



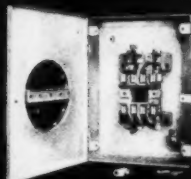
NEVER BEFORE—
such EASY installation!

No matter what form Murray Troughs or Cabinets may have—they are easy to install. They come ready to hang in a jiffy. Concentric knockouts, and plenty of 'em, make it easy to pull cables and wires through. Murray Pressure Connectors open side-ways so the continuous service cables are merely skinned at the connectors, dropped in place and tightened. The joints are like solid metal. There's both profit and satisfaction in installing these modern, approved devices. Metropolitan Device Corporation, Brooklyn, N. Y.

Mail!



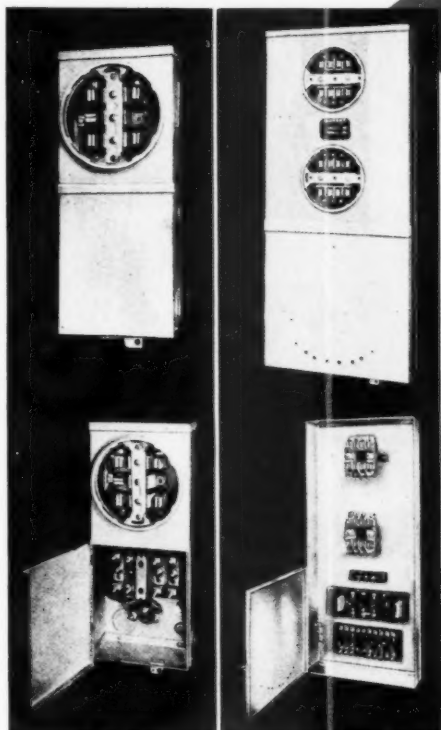
THIS FREE BOOK
TELLS THE WHOLE
STORY OF MURRAY
TROUGHS AND
CABINETS IN PICT-
TURED DETAIL AND
SIMPLE LANGUAGE.
EVERY CONTRAC-
TOR NEEDS ONE.



METROPOLITAN
DEVICE CORP.
1250 Atlantic Avenue
Brooklyn, N. Y.

Please send me free of cost or
obligation 20-page Murray Trough Booklet.

Name _____
Company _____
Address _____



JUST OUT



Westinghouse Quick Selector



VOL. 1 - NO. 1
OCTOBER
1939
THIRD YEAR

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FUSE BREAKERS	PAGES 10-15
MULTI-BREAKERS	PAGES 16-19
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A QUICK SELECTOR INDEX.
ESSENTIAL INFORMATION BOILED
DOWN TO 60 PAGES.
WIRING HOOK-UPS YOU CAN USE.
CLEAR DESCRIPTIONS OF MODERN
FEATURES.
ACCURATE SPECIFICATIONS THAT
SAVE YOUR TIME.



Westinghouse

THE NEW WESTINGHOUSE QUICK SELECTOR

DESIGNED BY CONTRACTORS • DESIGNED FOR CONTRACTORS

SINGLE THROW SWITCHES

SAVINGS ON INSTANT
AND **SAFETY** ARE OBTAINED
INSTANTLY

FEASIBLE—That is, with
Westinghouse Safety Switches
you can:

BEST AVAILABLE—For a
quick choice and better
work.

SWITCHES FOR GROUNDED SYSTEMS

SAFETY IN BEST LAD WITH
INSTANTLY OBTAINED BY
SAFETY SWITCHES

ONE FROM OVEN
The new Westinghouse Safety Switches
are designed for use in the most
dangerous places. They are the only
switches that can be used in the
most dangerous places.

A PLAN FEATURE OF
THE SAFETY SWITCH

SWITCHING AND SOLID
NEUTRAL FUSIBLE SWITCHES

TYPE	TYPE A	TYPE B	TYPE C	TYPE D
1/2" 1500	1.00	1.00	1.00	1.00
1/2" 1000	1.00	1.00	1.00	1.00
1/2" 750	1.00	1.00	1.00	1.00
1/2" 500	1.00	1.00	1.00	1.00
1/2" 250	1.00	1.00	1.00	1.00
1/2" 125	1.00	1.00	1.00	1.00
1/2" 62.5	1.00	1.00	1.00	1.00
1/2" 31.25	1.00	1.00	1.00	1.00
1/2" 15.625	1.00	1.00	1.00	1.00
1/2" 7.8125	1.00	1.00	1.00	1.00
1/2" 3.90625	1.00	1.00	1.00	1.00
1/2" 1.953125	1.00	1.00	1.00	1.00
1/2" .9765625	1.00	1.00	1.00	1.00
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1/2" .000000000000				

How Employee Efficiency Is Increased by This NEW COLD Fluorescent Lighting

A New Lower Cost Way of Obtaining the Higher Levels of Illumination Necessary to Improve Workmanship and Employee Morale

Fluorescent Lighting provides management with a new opportunity to improve plant "Seeing Conditions" and thus improve accuracy of workmanship production, employee morale, safety and all-round efficiency.

Scientific laboratory tests and practical plant experience have demonstrated that when plant "Seeing Conditions" are improved by raising the levels of illumination and improving the quality of the light, seeing speed is increased and eyestrain and eye fatigue are reduced to a minimum. See Data Sheet No. 11 as published in **FACTORY MANAGEMENT & MAINTENANCE**, October, 1939.

A New Advance in Better Lighting

Fluorescent Lighting marks the attainment of a long sought goal. It makes possible higher levels of unusually fine quality light at lower cost. It enables you to obtain a light of accurate daylight quality and secure

higher intensities without annoying glare or heat. Full advantage of this new light for both general and localized lighting may now be had through the installation of Benjamin Lighting Units especially designed for the 36" and the new 48" Fluorescent daylight and white light lamps.

A New Type of General Lighting

In the early development of Fluorescent Lighting its application was confined chiefly to localized lighting. Now with the introduction of the new Benjamin "STREAM-LITER," efficient and economical Fluorescent Lighting is available for the first time for general illumination.

Only by first hand experience can the daylight quality, comfort and softness of this new diffused lighting be fully appreciated. It is truly one of the most important advances ever made in general overhead lighting.

Due to the higher light output of the Fluorescent Lamps, and the high efficiency of Benjamin Fluorescent Lighting Units, this new, fine lighting usually can be obtained at a lower operating cost than that formerly required to secure comparable results.

New Solution to Local Lighting Problems

It is now practical to mount high intensity lighting units, delivering 100 to 150 foot-candles, close to the working plane of inspection tables, production lines, assembly benches, etc. Never before has it been possible to provide such high intensity lighting without annoying glare and annoying heat. Because the light generated by the Fluorescent lamp is cold light, there are no annoying heat radiations. Because these lamps have an exceptionally low brightness factor, glare is reduced to a new low minimum. Because the light source is long, it is ideal for localized lighting.

Color Corrections

For operations involving color, an economical light of exceptionally fine daylight quality can be obtained through the use of Benjamin Fluorescent Units with daylight lamps. This light is produced without the use of the filters which heretofore have been necessary to produce "daylight" with the ordinary incandescent lamp. The heavy light loss from filters is thus eliminated.

Approved by Underwriters' Laboratories

These and other Benjamin Fluorescent lighting units are ruggedly constructed, easily installed and maintained, give the highest light output efficiency, and are warranted to comply with all recognized electrical, illumination and mechanical standards. They are approved by Underwriters' Laboratories as evidenced by the inspection label affixed to each unit.

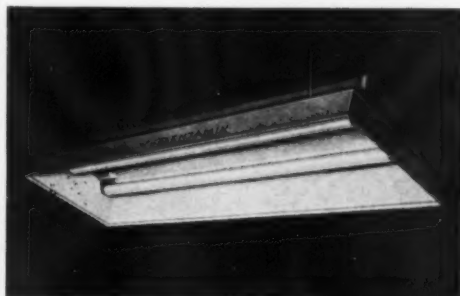
Make Needed Changes Now

Does your lighting meet present day requirements for increased production, higher inspection standards, overtime or extra shifts? A Benjamin Lighting Specialist will be glad to make specific recommendations. By training and experience he is an expert in industrial lighting and his services are available to you without cost or obligation.

Send for These New Bulletins

Complete information on Benjamin Fluorescent units is contained in Bulletin No. 600. Your return of the coupon below will bring you this bulletin now and place your name on our list to receive new Bulletin No. 610, now in preparation.

The Low Brightness Quality of the Fluorescent Lamp is combined with the unexcelled Diffusion Quality of Porcelain Enamel in the New, Low Cost



BENJAMIN STREAM-LITER

Designed specifically for general industrial lighting. Uses two 48" Fluorescent Lamps. The porcelain enamel reflector with 72½° cut-off shields lamps. New type auxiliary and starting switch; corrected for power factor and flicker. Uses approximately 100 watt. Provides 15 to 25 foot-candles on working surface. Available after December 15, 1939.

NEW BENJAMIN FLUR-O-LITER

Provides 75 to 150 foot-candles when mounted locally over inspection tables, production lines, or work benches. Also adapted to higher mountings. Uses two 48" Fluorescent lamps with individual Alzak aluminum reflector enclosed in steel housing. New auxiliary and starting switch; corrected for power factor and flicker. Available after December 15, 1939.

Other units for the 18", 24", 36" lamps and for single 48" lamps now available.



BENJAMIN
TRADE MARK
LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers

BENJAMIN ELECTRIC MFG. CO., Des Plaines, Illinois.
Gentlemen:

- ☐ We are interested in data to show how our lighting may be improved send us your Bulletins No. 600 and 610.
- ☐ We would like to arrange for a FREE DEMONSTRATION.

Name.....

Title.....

Firm.....

Address.....

City..... State.....

Electrical Contracting

With which is consolidated The
Electrict and Electrical Record
Established 1901

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

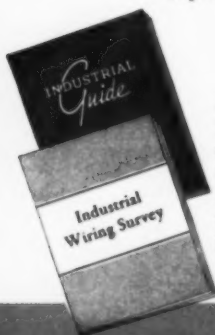
**Make it
happen
to you!**

\$1,400 annual savings by hosiery mill follows higher P. F.

Here's more proof that a wiring survey is a profitable device for electrical contractors. In a hosiery mill where small motors had been installed from time to time, a wiring survey revealed that failures in the electrical system were imminent. Power factor had dropped to 34%; feeders were heated and overloaded. The survey helped avert a breakdown by showing where a new wiring system including new feeders, distribution circuits and capacitors was needed. After these improvements were installed, the power factor rose to 80%, heating of feeders stopped and motor operation became normal. At the same time billed demand was reduced 45% and the total cost of power was cut more than 32%, representing a saving of \$1,400 annually.



Anaconda Duracode
Anaconda Duracode—Duracode insulation represents the first successful attempt to combat the destructive effect of heat and oxidation with one all-purpose building wire. Write for further information describing this improved Anaconda industrial cable.



Use These Two Books

As a qualified electrical contractor, you are equipped to make wiring surveys in industrial plants. All you need are these two free books—the "Industrial Wiring Survey" which tells you how to check up circuits and the "Industrial Wiring Guide" which tells how to correct the conditions found. Use these books in soliciting profitable wiring contracts. Ask your regular Anaconda distributor for your copies.



"Say, the electricity's off again"

Show How Breakdowns Can Be Prevented!

EVERY electrical breakdown means idle workers as well as idle machinery. Worn-out, inadequate wiring systems and failure to provide proper wiring for additions to equipment, as in the case of the hosiery mill mentioned above, are the reasons for power failures and the equally costly power losses that precede them.

According to authorities, nine out of ten industrial plants in the country are paying out good money in power losses, and inviting electrical breakdowns because they are unaware of their plant's electrical conditions!

Here is a profitable field for the electrical contractor. Offer the firms in your community a wiring survey—show them where savings can be made.

Use the two books shown opposite.



**USE MODERN
IMPROVED**

Anaconda Wire & Cable

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company, Sales Offices in Principal Cities

NOVEMBER, 1939

"Sic Semper"—Again

ON THE ANCIENT SEAL of the Commonwealth of Virginia is the picture of a Johnnie with a sword and shield. He holds high the head of his enemy, whose fallen body lies under his foot. And there is a motto—"Sic Semper Tyrannis!"

THESE ARE COMMONLY SUPPOSED to be the last words of the victim, saying—"Take your foot off my neck!" But not so! The Virginia colonial patriots were just declaring—"Thus ever tyrants!" in the fine two fisted spirit of the Boston Tea Party and King's Mountain. They were stating again our No. 1 American Principle, that men should have the right to make the rules they live under.

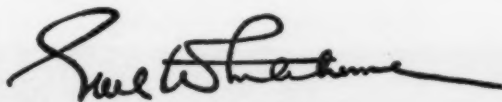
NOW FAR BE IT FROM ME to liken the NFPA Electrical Committee to George the Fathead, who drove us to war in 1775. But while the matter is up, I'd like to strike another blow for freedom. I would declare that the electrical contractor is not adequately represented on this tribunal that administers the National Electrical Code.

BELIEVE IT OR NOT, there are 51 men voting on this Electrical Committee and only two of them are contractors. But there are 16 members in the utility and manufacturing group, 13 in the insurance interests group, 3 in the specifications and customers group, 10 in the governmental group and 7 in the inspection group.

I HAVE NO WORD OF CRITICISM for any member of this Electrical Committee. But after all—a joke is a joke. Electrical contractors have wired all the buildings in America. Why don't they have more to say in making the laws that govern wiring?

THIS IS NO "YANKEE DOODLE" PLAYING—no call to arms! There is no tyrant to sic anybody on. No one can be blamed for this injustice except the electrical contractor himself. He has permitted it to happen, that's all. He has been represented on the committee by strong men who have done well. But what are two among so many?

NEXT MONTH THE ELECTRICAL COMMITTEE will come together to decide on the eight proposals of the power companies. Contractors will appear with a major interest and small voice in the meeting. They need more members, to vote their importance in deciding on such Code changes.



HAVE YOU EVER SEEN A FLOODLIGHT SO EASY TO SERVICE?

THE ease and convenience with which G-E Novalux Floodlights can be relamped and cleaned are important factors in any type of floodlighting job. (1) The G-E floodlight can be raised or lowered to any position convenient for servicing. (2) The sliding door can be removed simply by releasing a single clamp. (3) If the special repositioning stop is used, the projector can be returned to correct position merely by letting it fall back against the stop. (4) Clamping bolts are conveniently located and can be easily reached and adjusted. Servicing is done quickly and at small expense.

These helpful features—that distinguish G-E floodlights—have proved their worth on many installations. Together with the qualities of sturdy construction, trim appearance, and high efficiency, these features have earned nation-wide acceptance for G-E Novalux floodlights. Try G-E floodlights on your next job. For further information, send the coupon to General Electric, Schenectady, N. Y.



This resetting ring, which costs very little, is the reason that you can turn the G-E floodlight over with full confidence that when you put it back the aiming will still be correct.

Service man easily reaches G-E floodlight. He loosens clamping bolt on right side and prepares to raise unit to convenient position.



Floodlight is easily raised, and service man now loosens single clamp on sliding door. He does not lean over platform edge but works in safety.



Door is off, and service man replaces lamp. Then he replaces door and lets unit slip back against repositioning stop. Correct adjustment is maintained.



General Electric, Dept. 6A-201
Schenectady, N. Y.

Please send me your Floodlighting Catalog GEA-1865C.

Name

Street

City..... State..... 500-3

GENERAL ELECTRIC

The New Orleans Charity Hospital Job



MAIN BUILDING, Louisiana Charity Hospital, contains 30 operating rooms and 2,344 beds. New nurses' home, with scaffolding, is at extreme right.

This project is outstanding among large electrical jobs to be completed in 1939. It has a high tension underground multi-building distribution and emergency lighting systems of interest to electrical contractors.

By
Louis N. Goodman
Electrical Engineer

WHEN present construction is completed, the new Charity Hospital of Louisiana at New Orleans will be among the finest of its kind in the country. It was built by the State of Louisiana with the aid of the Public Works Administration. The new main hospital building, with its 2,334 beds, is said to be the largest single hospital unit under one roof in the world.

The underground distribution system and all new building work, with the exception of the power house and auxiliary buildings additions, was done under

contract by Hart Enterprise Electrical Co., Inc., of New Orleans. The contract for the power house and auxiliary buildings additions was handled by the Industrial Electric Co., Inc., also of New Orleans. The total of all electrical contracts amounted to well over three-quarters of a million dollars.

The architects on the project were Weiss, Dreyfous and Seiferth of New Orleans. The consulting engineers were: electrical, William H. Emmis; structural, George P. Rice; mechanical, F. H. Chisholm, all of New Orleans.

The 20 story main building is built of steel and concrete with natural limestone facing. It is fireproof throughout and a substantial portion of the interior is air-conditioned. The entire twelfth floor is used for 30 operating

rooms. This building contains the following electrical systems.

- (1) General lighting and secondary power system—177 branch circuit panelboards.
- (2) Emergency lighting.
- (3) X-Ray power, 240 volt single phase—6 panelboards.
- (4) X-Ray view boxes—500 stations.
- (5) Nurses call—1790 stations.
- (6) Doctors paging—480 name capacity.
- (7) Staff register—300 name capacity.
- (8) Loudspeaker sound system for basement, 5, 7, 11, 12th floors, with a 16 channel loudspeaker "Central" on 12th floor.
- (9) Electro-pneumatic tube.
- (10) Private telephone—670 telephones, 1200 lines.
- (11) Public telephone—150 stations.
- (12) Western Union and Postal Telegraph stations.
- (13) Fire alarm—34 stations.
- (14) Electric clock, with built-in neon illumination, sweep second hands and quadrant dials for secondary clocks.

- (15) Sterilamp coverage of all corridors, operating room and maternity ward entrances.
- (16) Elevators—22 full automatic signal controlled.
- (17) Electric lifts—4.

The 20 story nurses' home is steel and concrete construction with brick facing. It contains the following electric systems:

1. General lighting and power.
2. Private telephone system.
3. Public telephone system.
4. Fire alarm.
5. Western Union and Postal Telegraph stations.
6. Electric clock system.
7. Latest design of signal-controlled electric elevators.

The new laundry utilizes the latest designs in motorized laundry equipment with a total load of 270 horsepower.

The addition to the power house contains air-conditioning and running ice water equipment totalling 800 horsepower, auxiliaries for the steam plant, a 1000 kw. emergency turbo-alternator set, a transformer vault, a secondary switchboard and a synchronous motor switchboard supplying all the equipment mentioned. The control panels for light and power for the various building units are also located here.

Distribution System

Power for the entire hospital group is distributed underground from a vault at the rear of the main building. The first section is used by the New Orleans Public Service Co. for its main service equipment, supplied by two separate under-

MATERIAL INSTALLED IN THE MAIN HOSPITAL BUILDING ONLY

QUANTITY	MATERIAL
324 miles	No. 16 to No. 8 RC wire incl.
13 miles	No. 6 to No. 4/0 RC wire incl.
7 miles	300 MCM to 750 MCM RC wire incl.
5 miles	No. 12 to 1,000,000 CM lead covered wire
7 miles	No. 18-2 conductor all rubber shielded telephone and speaker cable
3.5 miles	No. 19-2 and 3 conductor telephone wire
1100 feet	No. 6 and No. 4-3 conductor 15 KV lead covered cable
700 feet	No. 4/0 Solid 15 KV cable
121 miles	1/2 in. to 1 in. galvanized conduit
8.8 miles	1 1/4 to 4 in. galvanized conduit
16,000	4 in. octagon and square boxes
1,397	Fan hanger outlets
583	Secondary clocks
528	X-Ray view boxes
544	Double nurses call stations
1,246	Single nurses call stations
183	Feeder circuits

ground, 3-phase service cables, each 3-conductor, 300,000 cm, paper insulated, at 13,800 volts. These primaries are fed from different sources, to insure uninterrupted service.

From the service and metering equipment the power supply passes through current-limiting reactors, step voltage regulators, and primary metal-clad switchgear equipment in the middle section of the vault. The switchgear consists of 10 cubicles, one for the main service, one for metering and eight for the outgoing primary feeders. All breakers are rated at 600-amperes, 15,000 volts, 50,000 kva interrupting capacity. They are solenoid-operated with 120 volt direct current supplied by the storage battery emergency lighting system in the main building.

Primary feeders at 13,200 volts, 3-phase, radiate from the switchgear units to seven transformer vaults, four of which are in the main building. In general, transformation in these vaults is from 13.2 kv to a secondary voltage of 120/208 volts, 3-phase, 4-wire. In vault No. 5 the secondary voltage is 2.2 kv for the air-conditioning motors. Power from vault No. 6 is furnished at 220 volts, 3-phase, and lighting at 120/240 volts, 3-wire, single phase, to serve present buildings. Each vault has a manual operated oil circuit breaker in the incoming primary feeder.

Two 2200-volt solenoid-operated oil circuit breakers for the air conditioning motor feeder, and the main feeder from the emergency 1000 kw turbo-alternator are in the power house vault No. 5.

Vaults 1, 5, and 6 have forced ventilation from duplex fans, so arranged that failure of one fan will automatically start the second one. All of the 13.2 kv underground power distribution is varnished-cambric-insulated lead-covered cables in fiber conduit embedded in concrete. All other underground circuits, including telephone, were run in fiber conduit in concrete. Sixteen new power and 14 new telephone manholes were required.

Primary busses in the vaults are 15,000-volt No. 4/0 solid insulated cable. Most of the secondary busses are built up of 1/2 in. by 4 in. copper.

Emergency Lighting

Emergency lighting for the main hospital building is provided by two 400-ampere hour, 120-volt, storage battery banks of 60 cells each. Each bank feeds the emergency lights of approximately half of the building, through an automatic transfer switch. The banks are independent of each other but either bank can be connected to the entire emergency load if necessary. This emergency system supplies corridor, operating room, and maternity ward lights; a motor-generator set for the clock system, and other necessary lighting outlets. It also supplies permanent direct-current for the operation of all solenoid-operated oil circuit breakers in the main hospital building and power house.

For emergencies when the storage battery banks might be overloaded or the building cut off from motor service for too long an interval, the 1000 kw turbo-alternator set is used. Circuits are so arranged that the 1200 kva three-phase transformer in the power house vault No. 5 can be disconnected from the air conditioning motor switchboard and used as a step-up transformer. This transformer takes 2200-volts primary from the turbo-alternator, steps it up to 13,200 volts secondary, and feeds back over its normal supply feeder into the busses of the primary switchgear in the main vault. From this point 13,200 volts goes out over the normal distribution system.

Control System

Control of all primary oil breakers in the main vault is centralized on control

MULTI-BUILDING UNDERGROUND distribution system covering d.c., high and low tension a.c., and control cables. All high tension feeders originate at vault No. 1 in main building. Shaded areas indicate new building construction



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TRANSFORMER ROOM of main underground vault, showing the three 333 kva, 13,200 volt transformers and connections.



SEALING CONDUITS of 15 kv cubicles in main underground vault by wiping cable sheaths to brass conduit wiping caps.



EMERGENCY POWER is supplied by this 1000 kw, 2200 volt turbo-generator located in the power house.

panels in the power house. The main breakers for the turbo-alternator, the air conditioning motor switchboard, and a transfer breaker that connects the alternator to the 1200 kva transformer are also controlled from this point. Meters, protective relays and voltage regulators are also on these panels.

Remote control of the nine solenoid-operated primary breakers in the main vault is provided by a 30-conductor control cable from the vault to the power house panels. A 4-conductor cable controls the two 2200 volt breakers in vault No. 5. These breakers are connected to a transfer switch which disconnects the air conditioning board and connects the 1000 kw alternator to the 1200 kva transformer in one position and reverses the sequence in the other. This prevents throwing the heavy air conditioning load on the emergency alternator.

Waterproofing Methods

The ground water level in New Orleans is only a few feet below the surface. Elaborate precautions had to be taken to waterproof all underground vaults and seal all conduits. Vaults below street level were provided with automatic sump pumps. All mounting bolts were cast in the walls to prevent subsequent drilling and damage to the waterproofing. Where drilling was necessary, unplated iron bolts were set head first in the concrete and driven up tight with lead wool.

Where cables emerge from underground conduits, they were wiped to brass wiping caps to prevent water leakage into the vaults. To avoid numerous wiped joints, all conduits to wall switches and receptacles in the basement of the main building were routed from the ceiling down rather than from the floor up.

Grounding Provisions

Each transformer vault at or below ground level was grounded to six 2-inch brass pipes driven in the ground and connected by 500 cm bare copper cable before the floor slab was poured. All copper and pipes except those necessary for the equipment and system grounds were covered by the floor slab. The entire conduit system was bonded to the water mains.

Transformer vaults on the upper floors were grounded to $\frac{1}{2}$ in. by 4 in. copper bus welded to the steel building frame which in turn was bonded to the water mains as well as a driven ground network.

The electrical work on this project was on so large a scale that it is beyond the scope of the ordinary type of work done by a majority of electrical

contractors. However, the general scheme of high tension underground multi-building distribution, the private power supply, the feed back system for emergencies, and the methods used to combat hydro-static pressure, make this installation outstanding. These features should be of interest to all.

BUILDING AND FEEDER SCHEDULE CHARITY HOSPITAL OF LOUISIANA AT NEW ORLEANS

Buildings and Load Divisions	Fed from Transf. Vault	Transformer Vaults — Total KVA	Fed by Secondary Switch Board	Total No. Secondary Feeder Circuits	Secondary Voltage
Main Building — Basement — 1st and 2nd Flrs.	No. 1	1000 Light & Power.... 15 Street Lighting.... 75 X-Ray Service....	No. 1	48	120-208, 3 phase-4 wire
Main Building — East Wing 14th floor.	No. 2	450 Light & Power....	No. 2	36	120-208, 3 phase-4 wire
Main Building — Center Section 20th floor.	No. 3	600 Light & Power.... 200 X-Ray Service....	No. 3	36	120-208, 3 phase-4 wire; 240, 1 phase
Main Building — West Wing 14th floor.	No. 4	450 Light & Power....	No. 4	32	120-208, 3 phase-4 wire
Air Conditioning Motors.....	No. 5	1200 Air Cond.....	No. 5A	3 4	2200-3 phase-3 wire 208-3 phase-3 wire
Steam Plant Auxiliaries..... Ice Plant..... Warehouse and Shops..... Animal House..... Laundry..... New Ambulance House..... La. State Univ. Medical Center..... Delgado Memorial..... Miltnerberger Convalescent Home..... Dilbert Tuberculosis Memorial..... Vincent Memorial..... Sister's Home and Chapel..... Old Nurses' Home..... Outbuildings.....	No. 5	750 Light & Power....	No. 5	20	120-208, 3 phase-4 wire
New Nurses' Home.....	No. 6	450 Light & Power....	No. 6	12	240-3 phase-3 wire 120-240, 1 phase-3 wire
	No. 7	300 Light & Power....	No. 7	30	120-208, 3 phase, 4 wire

Tulane University Medical Center — Fed by Independent 2.3 kv. Service and is Not A Part of Above System.



NECA *Meets in*

PROGRAM, exhibit, attendance and entertainment, the 37th Annual Convention of the National Electrical Contractors Association, in Philadelphia, Oct. 9-12, rang the Big Bell. Registration crowded 400. Some 48 manufacturers displayed their new products. And "a pleasant time was had by all" from the informal reception Sunday night until they dragged their weary bones out of the New York World's Fair on Friday night, or Saturday or Sunday or whenever it was they had enough.

The program presented a review of industry problems and opportunities of unusual scope and interest. Here is the running story of what happened—

MONDAY MORNING

Peak Speaks Out

Horace P. Liversidge, president of the Philadelphia Electric Company, opened the first meeting. He welcomed NECA to the city of Ben Franklin with a characteristically frank statement.

"In the past years," he said, "there may have been a tendency on the part of some utilities to believe they constituted the whole electrical industry. But the electrical contractor has been the advance guard of the electrical industry. Before we could sell new customers or more load, local contractors have efficiently performed their work. Now re-

wiring by the contractors is one of the industry's greatest needs. Sooner or later, I think, it will be necessary for you to go out more aggressively after business with a more comprehensive selling plan. The utilities are prepared to take care of their part."

Reporting on "Twelve Months of Progress", President Earl Peak stepped right into the Code controversy by urging a conference by electrical manufacturers, wholesalers and contractors to study the possibilities of reducing the cost of wiring, not by reducing standards but by the elimination of excess and duplicating varieties.

"We have two kinds of pipe, 1500 types of boxes, many new wires," he said. "Other industries retire old models when they are improved. Why don't we?"

This he believes would produce far more results than the continuing unproven charge by the power companies that "the cost of wiring is holding back the progress of the industry." This he said is no more constructive than if the contractor should launch a campaign against the "high cost of current".

Citing the growing volume of wiring being done by men sent to the customer by the mail-order-chain houses, Peak called on manufacturers and wholesalers to clean up present tooth and claw trade policy and practices before house wiring is entirely lost to the established electrical distribution. He professed confidence that the condition under which REA line work must be done will now be improved.

A round-up on conditions in the divisional areas served by NECA Executive Committeemen followed.

MONDAY AFTERNOON

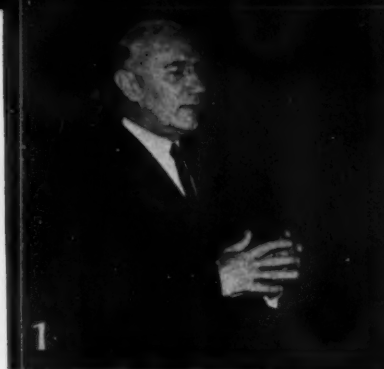
Spotlight on Labor

E. C. Carlson's Labor Relations Committee staged a special session the first afternoon, featuring three speakers.

M. H. Hedges led, pinch hitting for D. W. Tracy, president of the International Brotherhood of Electrical Workers, who was unfortunately ill. Mr. Hedges is Director of Research of IBEW.

Mr. Tracy's paper raised the question often asked, "How is it that a

NECA contractors enjoy a strong program—Elect R. W. McChesney president—Move for an industry conference to simplify and standardize all wiring materials and equipment.



1 GREETINGS!—Horace P. Livsidge, president, Philadelphia Electric Company, welcomes contractors to the Quaker City.



2 LINE UP—of Divisional Committeemen ready to report for back home.

ts in Philadelphia

union aggressive as IBEW can preach and practice cooperation with employees?" He proceeded to show that a union finds its best opportunity as a service organization, guiding and supporting its members, and providing labor to its industry where it is needed. The New England hurricane emergency is such an example.

"Unions are not valued for their nuisance capacity," he said, "but for their ability to aid in solving the problems of management. And when unions are taken into cooperation, strike threats diminish." He appealed for a creative program for industry development in which labor and the employer can unite to mutual advantage.

L. K. Comstock, Chairman of the Council on Industrial Relations, presented another viewpoint on labor relations. He described the purpose and progress of the Council.

Through voluntary cooperation, it is trying cases where local unions and contractors associations cannot come to agreement. It has established a form of local agreement, combining fundamental principles and working rules, on

3 HERE'S HOW—Ernie Hedler, Philadelphia, and S. J. O'Brien, New York, start the party with a breaker of suds on Sunday evening.

4 FRESH HARMONY—Al Stone, Los Angeles, and Bob Ingalls, Miami, lay aside the climate argument.

5 PINCH HITTER—H. M. Hedges, who presented D. W. Tracy's paper, faces George Andrae and E. H. Herzberg of Milwaukee.

6 FORWARD PASS—Earl Peak hands his worn gavel to new president Bob McChesney.

7 WALL FLOWERS—Lincoln Bush and George Patterson propped against the wall between sessions.





Labor's Willingness to Do Its Part

D. W. TRACY, President
International Brotherhood
of Electrical Workers, Wash.

Unions, working as service organizations, can make contributions to the problems of management. If unions are taken into a project on a cooperative basis they become an integral part of the business.

With the union organization of the electric utilities and electrical manufacturing, the electrical construction branch has a closer relationship to the industry as a whole. It calls for more cooperation between employers and the union.

The labor bill now rests between 33 and 38 percent of the job in residence construction. Last year electrical workers averaged \$1500 a year income, with 71 percent employed. Apprenticeship training and shrinkage of job opportunity are serious problems. They should be faced on a rational basis. Let us be creative and build for the future of the industry—employer, labor, contractors, utilities, manufacturers and the public. Let us be constructive.

Through cooperation of thoroughly organized employers and employees, sales can be promoted, maintenance work recaptured, house wiring cultivated and the contracting industry can be given a new birth. There is no conflict between the two, once collective bargaining is achieved by cooperation.



The Council on Industrial Relations

L. K. COMSTOCK
Chairman, Council on Industrial Relations,
Electrical Construction Industry.

The chief objectives of all labor relations are continuous production, continuous wage and continuous good feeling. But dealing with labor problems by law, sooner or later means dealing "at arms length".

The Council offers a method of voluntary cooperation. It is the method of common sense. The strike is not common sense. In it the rule of force triumphs over the rule of reason. The rule of force is barbarism.

The Council is prepared to hear and determine any dispute between a local IBEW Union and a local association of electrical contractors. There is no cost to the disputants. In 20 years questions involving wages, interpretations and working conditions have been determined in 25 cities in 16 states. They have presented no difficulties to the Council, because its members are free from local antagonisms and rivalries.

The Council is a court of justice, not merely an arbitration board that merely effects some compromise. It relies upon the fairness, instinctive in individuals, to act correctly when they have the facts. It substitutes for strife and wasteful competition, a more enlightened form of cooperation with labor.

a basis that does not require renewal, but can be revised or terminated on a year's notice. When lack of local agreement comes, the issue can be brought to the Council, not for compromise but for settlement. Twenty years of experience has proved it practical and effective.

Declaring that the only sound basis for labor relations is steady work and profits, Earl Whitehorne, Editor of ELECTRICAL CONTRACTING, analyzed the opportunity for better selling that lies ahead for the electrical contractor. But the first step, he said, should be preparation for the job, as vital as assembling men, tools and materials for a construction job.

The markets, he declared, are apparent and available. But to reach them easily, intervening obstacles should be cleared away—such as troubles with labor and bad trade practices. We need

statewide inspection and licensing, and better estimating and accounting standards to make this a better business, attracting better men.

Taken singly, he said, these problems can be licked. It will open the way for rewiring America, profitable specialization, and the recovery and development of other markets.

MONDAY EVENING

Estimating Clinic—Secretaries

George Patterson, Toronto, Chairman of the NECA Cost Data Committee, put his labor units over the jumps in an evening meeting, that brought out almost the full attendance. He was assisted by Ray W. Ashley, Research Engineer for the Chicago Electrical Contractors Association. They talked over the NECA Manual, its value, its application and how to

promote its wider use.

Then followed a conference of chapter secretaries and managers of local associations. It was an experience meeting focussed on the job of advancing local cooperation among contractors.

TUESDAY MORNING

Watts, Costs, Law

Walter Collins, Secretary of the Chicago Electrical Contractors Association, opened with one of his inimitable discussions of "the thief in the wire", meaning "wasted watts". Voltage drop accumulates through bad installation design, he said, with long and unbalanced subfeeders, insufficient and poorly routed circuits, inadequate or improperly placed outlets, poor and wrong lighting units and ill chosen motors and appliances.

Out of it comes wasted money, not

CALIFORNIA EXHIBIT—Al. Stone, Ken Ryals, Clyde Chamblin and Bill Cyr line up after the meeting.

REA SPEAKS—Lee Moore, REA engineer, talked simplified wiring for cotton croppers.

GOOD RELATIONS—E. C. Carlson, who heads Labor Relations, tries it on Wm. McGuineas, Chicago.

EXHIBIT BOSS—W. E. Frazer with H. P. Liveridge. "W.E." was exhibit chairman.

LEAF RAKERS—Peak, Jack Chanan, Link and Steve O.



Let's Pass the Gravy

EARL WHITEHORNE
Editor
Electrical Contracting



Electrical contractors begin to realize they must organize for better selling. They have done a good engineering and mechanical job. They must now do a good business job.

They must prepare for better selling in seven ways—1. Better team work with labor; 2. Better trade practices in the electrical industry; 3. State inspection throughout the country; 4. State license laws that are fair and effective; 5. Better estimating taught in local classes for contractors; 6. Better accounting methods taught in local classes; 7. National statistics showing the volume of electrical contracting business, what is sold and where and who to.

This will pave the way for business development in at least seven directions—1. Rewiring of industrial, commercial and residential buildings; 2. Specialization on seasonal or other markets—range wiring, attic fans; 3. Service to factory maintenance staffs on extensions and breakdowns; 4. Group selling to local management to build prestige; 5. Recovery of abandoned markets—signal, sign and radio work; 6. New work—telephone raceways, highway safety lighting; 7. Rural electrification.

Selling is not just asking for orders. It means having a plan.

Wasted Watts

J. WALTER COLLINS
Secretary, Electrical Contractors
Association, Chicago



Wasted watts caused by voltage drop, the "thief in the wire," comes from—1. Long feeder runs with few fuse centers; 2. Poorly routed circuits; 3. Inadequate outlets; 4. Poor lighting fixtures with bad ventilation. The average commercial building is put up in six months and operates 20 years. Energy costs, including losses due to voltage drop and inadequacy are charged to overhead.

The average voltage drop on residence systems is four per cent. Assuming that two per cent of this is excessive, a conservative estimate of the annual money loss to the public is \$43,400,000.

Wiring in the home is bought by the housewife and should fit her needs. So in planning outlets you cannot go by any set rule of so many feet apart along a wall. The number of outlets in a room should depend on how many appliances are to be used. With the "Collins Outlet Planner", adequate outlets can be installed to cover appliances along walls within four feet from the wall.

With this planner the contractors can show the home owner just what he is providing. For it takes something more than code requirements to lay out an efficient system.

alone through electrical losses but from delayed production, spoiled goods and waste time. These losses soon far exceed the added cost of an efficient electrical system. Just two per cent excessive voltage drop would waste 4 per cent of the money paid for energy and robs the American people of \$43,000,000 on present consumption, he said.

He also reviewed an "outlet planner" system which he has revised and expanded for locating outlets in residence wiring. It provides for complete floor coverage from connected appliances within a seven foot radius from receptacles.

Speaking on "Neglected Costs", Ray W. Ashley paid a high tribute to George Patterson for his splendid contribution in the revision of the NECA Labor Unit tables. He discussed the value of labor unit data when properly supported by figures on local experience.

In the original NECA Manual, units were based on ideal conditions. There is a new manual now, with practically every major table revised.

These tables are now consistent, he said. They provide a standard to be applied to the particular type of job, adjusted for the contractor's experience, organization, tools, mechanics available, time of year and method of charging nonproductive labor. But any labor units, he said, must be adjusted to local cost data for each contractor's own installations.

He discussed a study of overhead on different sized jobs recently made in Chicago and the factors that determine true overhead cost in operations. This embraced detail tables on overhead to be charged on tools, field office, cartage, office and administrative expense.

Clyde Chamblin, wound up this session. He presented a paper "Compe-

tion and the Law" by Walter J. Walsh, San Francisco counsel for trade associations, who was unable to be present.

Walsh is astonished at the number of contractors who believe that the law forbids them to make money. He proceeded to show that we are already hedged around with enough laws to keep us straight, if we conform. But bid peddling and other unfair trade practices are not in the public interest and should be restrained by honest cooperation that does not penalize the buyer or close the door to opportunity.

As illustration, he cited a California case of the master plumbers. Chamblin and W. A. Cyr, also of San Francisco, dialogued for court and witnesses.

WEDNESDAY MORNING

Andrae Talks Turkey—New Officers

The experience of several other industries in developing effective methods

SALESLEADERS — *Jack Line* and *Mike* leaning at *Brook Country* in case *W.P.A.* help.

SALESMANSHIP — *Howard Williams*, New York, gave some good sales dope from lumber experience.

NEW PREXY — *R. W. McChesney* of Washington, caught strolling in the banquet hall.

CONVENTION FINANCIER — *Howard Miller* looks over the exhibits and wonders — how — now?

MEDALIST — *Ralph Walker* receives McGraw Award, with *H. B. Frazer* and *K. D. White* at his right.





Neglected Costs

RAY W. ASHLEY

Research Engineer, Electrical Contractors Association of Chicago

If it were simple to collect labor cost data, there would not be so general a demand for it. But units established for a few jobs usually represent only part of the cost. They do not cover supervision and service to the job. But every labor unit

should carry a proportional share of these expenses.

The NECA Labor Unit Manual now provides such data. A well trained estimator, who will establish in his mind the relation of these tables to his local experience, can use them intelligently and profitably.

Another neglected cost problem comes with cost plus business. Here a recent study, presents comparative costs on an industrial job requiring 50 electricians, another needing five electricians and a wood joist dwelling calling for three electricians. Tables have been worked out showing investment, depreciation, cost of storage and repair of the tools required, the field office and shop building expense and other overhead costs.

In Chicago the average cost comes to 29.8 percent. Six other localities report an average of 38.6 percent. These tables are now being used successfully.



Homes for Low Income

J. F. O'BRIEN

Director of Research, John B. Pierce Foundation, New York

The bulk of the building market lies today in the low cost home field. The enormous number of families living on \$20 to \$30 a week cannot prudently spend more than that much a month for rent or to buy a home worth over \$2000 to \$3000.

Government surveys show a present need for 6,000,000 new dwelling units. By 1950 an additional 10,000,000 will be required. In the last 10 years, most houses have been built for \$50 rental or over; yet today that class represents but 10 percent of the market. Also, there are only one third as many in this class as there were in 1929. England is building for the low cost market, we are not.

The John B. Pierce Foundation, a non-profit research organization, has developed a pre-fabricated house to be produced by mass methods. With three bedrooms, a dining-living room and kitchen, it costs slightly over \$2000. It employs single thickness plywood walls, insulation, hot air heat, refrigeration, considerable built-in furniture, and surface wiring in plastic covered strips providing outlets every eight inches. All are included in this cost.

This experimental house may show the way for America's long waited small house revival.

opened the third morning meeting. It was presented by Howard Williams, vice president of Trade-Ways, Inc. He analyzed the sales approach to the consumer and drew on the record of the lumber dealer for illustration. He advocated the development of a studied sales technique for the electrical contractor.

George Andrae then stepped out with a vigorous discussion of the Code situation. Shall we discard safety to cheaper wiring or go forward with better engineering and better materials to gain more economies? This was the issue he raised.

He bluntly charged the power company Code proposals to the utility sales departments. He said that this attempt to make wiring more popular and salable by a reduction of 15 per cent in the cost of one item of wiring material, when the whole job only bulks 1½ per cent of the building cost, does not make sense.

Andrae then analyzed the recent NEMA report on the carrying capacities of wire. He urged that the use of the 50 deg. and 60 deg. C. Code grades be discontinued and that the industry standardize on the 75 deg. wire as the one and only Code grade. He recommended that paralleling of conductors from No. 14 to No. 1 be prohibited, but that running in multiple be permitted in sizes from No. 1/0 to 500,000 CM and standardized on 75 deg. insulation and that cable sizes over 500,000 CM be discontinued. He endorsed thin wall in-

sulation. Finally he proposed an industry committee to review the entire question of raceway occupancy.

The morning closed with the election of a president and executive committeemen for the coming year. (See next page).

Wednesday afternoon was devoted to a union shop contractors meeting. The Labor Relations Committee's field representative, Paul M. Geary of Youngstown, reported on his study of labor relations in the large number of cities he has visited. An open forum discussion by employers and IBEW executives followed.

THURSDAY MORNING

Market Angles

The final session of the convention opened with two speakers from Washington. F. S. Fitzpatrick, Manager of the Construction and Civic Development Department of the U. S. Chamber of Commerce, presented the program for the coming "mobilization of the construction industry" to be launched at the national capital Nov. 16 and 17. It will study the problems now besetting building contractors of all kinds and the conference will make plans to meet some of these conditions.

Lee Moore of REA, confessed father of the restricted service idea, said that there are countless tenant farmers in the cotton belt, who average 29 cents a day cash income. Hundreds of miles of lines are ready to connect them. They

cannot afford to pay more than \$40 to prepare for electric service.

REA has ordered 30,000 of the new 600 v.a. transformers and 30,000 circuit breakers and 3,000,000 feet of cable to give these people 600 watts of load. They hope to take over 130,000 of them with the farmer digging the trench and covering the service cable. Contractors are responsible for many features of installation design evolved by REA, he said.

The program closed with a talk by J. F. O'Brien, of the John B. Pierce Foundation, a non-profit organization now conducting research on low cost housing. He appealed for the help of the electrical contractor in developing low cost housing to be sold to low income groups, with governmental assistance, or on rental or favorable terms.

England is building large numbers of small homes for people of small means. America is still building homes to sell for \$5000, but there are only one-third as many families of that class as in 1929. Also we are peddling houses instead of producing them by mass methods. In America an average builder constructs 20 houses a year, in England 2000.

He showed pictures of a low cost pre-fabricated house experimentally developed by the Pierce Foundation. Built largely of standard materials, it was prepared by country carpenter, who when ready with piers laid, erected the house in one day to cost \$2000, ready to move in.

The meetings program wound up with

a group of resolutions among which the following were interesting:

1. To initiate an industry conference to study the possibilities of simplifying and standardizing electrical wiring materials and equipment and methods of installing them to promote economies in wiring.
2. To urge the Government to discontinue WPA activities and substitute public works, performed by the regular forces of the construction industry.
3. To urge manufacturers, wholesalers and power companies to feature in their advertising the suggestion—"Consult your local electrical contractor."
4. To protect the publication of trade prices to the public and to urge the observance of trade discounts by manufacturers and wholesalers.
5. To confer honorary membership upon Leo E. Mayer of Chicago, who served as president of NECA during NRA.
6. Other resolutions expressed appreciation to Ralph M. Walker, to Earl N. Peak and to Laurence W. Davis, for their services to the association, and to the local committee for their hospitality. Tribute was paid to the memory of Mrs. Ernest Cleary, Detroit; Mrs. J. N. Pierce of Chicago; and Mrs. H. C. Evans of Kansas City.

Jacksonville in 1940

The final business was done by A. L. Stone of Los Angeles, chairman of the Convention Committee. This loyal Californian, despite the traditional rivalry between these states, humorously humbled himself in announcing that the next convention will be held in Jacksonville, Florida, late in October, 1940.

The convention closed in Philadelphia, Thursday noon and the delegates took trains for New York, to visit the World's Fair. They left for home, footsore and weary, but unanimous in praise of this convention.

McChesney Now President

At the election of officers on Wednesday morning the following administration was established to carry on the work of NECA for the coming year:

President—R. W. McChesney, Washington.

New Executive Committeemen:

Division 1—New England—H. A. Pierce, Pawtucket.

Division 3—Middle Atlantic—W. E. Frazer, Philadelphia.

Division 6—Great Lakes—J. N. Pierce, Chicago.

Division 8—Southwest—Eugene Ashe, Fort Worth.

Division 9—Far West—A. L. Stone, Los Angeles.

Division 12—Western Canada—J. H. Schumaker, Winnipeg.

The terms of the other divisional executive committeemen have not yet expired.

Eugene Ashe was also elected a member of the Labor Relations Committee for the Southwestern district.

Before the election, NECA simplified its executive personnel by passing a resolution discontinuing the office of vice president. From now on a temporary vice president will be elected by the Executive Committee when an emergency requires it.

"And It Was Lots of Fun"

While the delegates were busy with business sessions, their wives and friends were enjoying the entertainment program. It started Sunday evening with a reception and buffet supper.

Monday afternoon was spent at Valley Forge, where Washington's army spent that tragic winter, and now a beautiful suburban country of fine farm estates. After dinner at Spring Mountain House, Schwenksville, the evening was given over to bridge at the hotel.

Tuesday featured visits to the Wanamaker store for shopping, luncheon and an organ program; to Longwood Gardens, the Du Pont estate at Kennett Square; and to a tour of Historic Philadelphia. And in the evening everybody



1 APPETITE CALLS—Arthur Abbott consults his watch during an after-session talk with C. O. Rickard, Detroit.

2 STAR GAZING—Contractors at the planetarium examine the machine that makes "seeing stars" a pleasure.

3 SECRETARY'S HUDDLE—Wm. A. Ritt, Minneapolis; H. P. Wilson, Rock Island; John A. Morrison, Philadelphia; parley at the Electric Association luncheon.

4 FRED TELLS 'EM—Fred Laube, Rochester, makes a point to his townsman W. J. Quinlan and D. G. Crimmins, New York.

5 HUNGRY AND HOT—Contractors toss off luncheon as guests of Electrical Association of Philadelphia.

6 ROUNDSMAN—Paul M. Geary, Youngstown, field representative of NECA Labor Relations Committee.

saw the Westinghouse technicolor movie "The Middleton Family at the World's Fair," really a fine show.

Wednesday, after a luncheon at the Electric Association of Philadelphia, there was golf at the Overbrook Country Club, where Jack Redmond, "around-the-world golfer," showed them just how it should be done. Other contractors went to the Franklin Institute. The climax of the entertainment program came that night with the annual banquet and dance. A splendid floor show followed.

The five-day "holiday" ended Friday with "National Electrical Contractors' Day" at the New York World's Fair.

Walker Gets McGraw Medal

At the NECA Banquet, on Wednesday evening, Ralph M. Walker, former vice president of NECA and chairman of its Trade Policy Committee, received the James H. McGraw Award Contractors Medal for 1939. This was in recognition of his long leadership in promoting better trade practice in the electrical industry. The presentation was made by Earl Whitehorne, speaking for the Committee of Awards. The citation read:

"Ralph M. Walker, president of the Walker Electrical Company of Atlanta, some years ago became convinced that the greatest obstacle to progress and prosperity in the electrical industry lay in the too common neglect of fair trade policy. And this neglect, he believed, came not from deliberate indifference to the moral or material advantages of fair dealing, as much as from a lack of understanding among electrical men of the simple underlying principles which must govern business conduct, if harmony and cooperation are to prevail within an industry.

He devoted himself to the study of trade policy experience in various fields and began to preach the gospel of common-sense self-government among electrical men, based on self-discipline, in order that frictions and conflicts in the inter-relations between them might be relieved and avoided. In a paper before the 33rd Annual Convention of the National Electrical Contractors Association in Chicago in 1935, he defined these principles and pre-

sented his philosophy of fair dealing. He became chairman of the NECA Trade Policy Committee and developed a 'Code of Buying Ethics' for electrical contractors, that offers them a practical guide in their relations with electrical wholesalers, manufacturers and power companies, as well as their other business contacts.

This Code, these principles, this policy, Mr. Walker has continued to expound and advocate at subsequent industry conventions and meetings and to support with the fine example of his own conduct, until he has become the outstanding champion of fair trade policy in the electrical industry. As chairman of the committee and as vice president of NECA, he has pursued this objective with unwavering zeal and, by the clarity and force of his reasoning, steadily broadened the interest of the industry in the practical possibilities of this ideal. Naturally the full attainment of his hopes has not been realized and may never be completely fulfilled, yet the influence of his persistent courage in pressing ever on has captured the attention of electrical men and encouraged a greater appreciation of the responsibility of the individual in these broad common obligations. And so by his writings, his speeches and his conferences with local and regional leaders of electrical progress throughout this country, he has so stimulated thought and crystallized opinion that the cause of fair dealing has been greatly furthered and strengthened.



ICE WATER GUARD—Wm. F. McCarter, Philadelphia, assumes pleasant duty in heat of opening session.



CONFIDENTIAL—Earl Peak and Larry Davis do a bit of whispering behind the speaker's back.

CARDEOGRAPH—O. V. Scott, Miami, has his heart beat recorded at Franklin Institute.



Mr. Walker was selected for this award by a committee of contractors appointed by NECA, including: H. B. Frazer, Philadelphia; R. W. McChesney, Washington; R. N. Morris, of Pittsburgh; and J. M. Richardson, Roanoke.

The Product Exhibit

The manufacturers' exhibit area flanked the convention hall on either side, so that everybody passed through it to reach the meeting room. Booths lined both walls with gay colored backgrounds. More than fifty companies presented displays of wiring materials and equipment.

The exhibits ranged from a locknut to a 3000 ampere circuit breaker. Wiring devices, outlet boxes, conduit, conduit fittings, wire, panels, safety switches, circuit breakers, controls, explosion proof equipment, fluorescent and mazda lamps and fixtures were featured.

A number of new developments made their bows. Much interest was shown in the new thin wall insulated wire, rubber and synthetic.

Frank Adam Electric Co., Aluminum Company of America, American Transformer Co., Anaconda Wire & Cable Co., Arrow-Hart & Hegeman Electric Co., Bussmann Manufacturing Co., Benjamin Electric Mfg. Co., Bryant Electric Co., Bulldog Electric Products Corp., Collyer Insulated Wire Co., Craven Electric Sales Co., Crouse-Hinds Co., Electrical Association of Philadelphia, General Electric Co., Phila., General Electric Wiring Devices, Gill Glass & Fixture Co., Gruber Brothers, Incandescent Lamp Dept. of G. E. Co., Hazard Insulated Wire Works, Henderson-Hazel Corporation, Heinemann Electric Co., Holtzer-Cabot Electric Co., Holophane Company, Harvey Hubbell, Inc., I T E Circuit Breaker, Ilco Copper Tube & Products Co., International Time Recording Div. of International Business Machines Corp., Jefferson Electric Co., Langanke Electric Co., W. A. Leiser, Jos. P. Manypenny, Miller Company, Murlin Manufacturing Co., NEMA Armored Cable Section, National Electric Products Corp., Pringle Electric Mfg. Co., Pass & Seymour, Inc., Philadelphia Electrical Mfg. Co., Steel City Electric Co., Thomas & Betts Co., F. W. Wakefield Brass Co., Walker Brothers, Walker Electrical Co., Westinghouse Electric & Mfg. Co., Westinghouse Lamp Division, Westinghouse Electric & Mfg. Co., Wheeler Reflector Co., Wiremold Company, Wm. Wurdack Elec. Mfg. Co. and Youngstown Sheet & Tube Co.

The Proposed Code Changes

NECA's champion of safe wiring standards here makes some thoughtful and pertinent recommendations in his address before the Philadelphia Convention.

By

George H. J. Andrae,

Milwaukee

NECA Member on
Electrical Committee, N.F.P.A.



YOU are all familiar with the Edison Electric Institute proposals.

During the past year their representatives have addressed meetings in practically every state in the Union, in probably one hundred cities. They have distributed a voluminous report to electrical committee members and electrical inspectors. They have sent out three booklets, probably the most elaborate and expensive ever presented by any one branch of the electrical industry to the other groups to promote an idea.

Let us simply state, that up to the present, the power and light group has failed to make out a satisfactory case for its bare neutral wiring proposals. There should be no burden on objectors to the EEI proposals to prove them wrong or to accept them. The burden is rather on the power and light group to prove them right, to the satisfaction of all other groups, who have not only a right but a duty to be skeptical until convinced.

The case for bare neutral and especially CNX cable is based by the utility group very largely on price, and on the questionable assumption that a lower unit cost will of necessity bring more outlets, more branch circuits, and a freer use of copper.

Electric wiring outlets have never been a merchandisable commodity, and cutting the price by using questionable materials, will not make them so. Whether we use BX cable, knob and tube, or CNX for new residence work, it will still always be a matter of sales-

manship and sales promotion work and not a matter of code rules and materials, to get more outlets and more branch circuits on the job.

Each of the three EEI booklets concedes that point by proposing group meetings for sales promotional work, canvassing prospects, etc. And all of this is to work wonders because house wiring, an item that averages $1\frac{1}{2}$ per cent of the building cost, has a 15 per cent reduction in cost on one item of material. I say, it doesn't make sense.

Conductor Capacity

For the first time in the history of Code making and inspection, we have tables of current carrying capacity for a complete range of conductor sizes, arrived at by tests conducted in a scientific way. For this we are indebted to the NEMA committee composed of S. J. Rosch, L. D. Youmans and G. W. Zink. The report establishes current carrying capacities for conductors insulated with Code, Performance, and Heat-resistant grades of rubber insulation, to operate at maximum permissible temperatures of 50, 60, and 75° C. respectively. A study of these tables discloses some rather interesting and startling results.

The NEMA report states that Code grade wire could not be operated with currents producing 60° C. without damage to the insulation. However, we find that this same 50° code grade wire, when carrying such a current in the

copper conductor that a temperature of 50° C. results on the insulation, can carry much less current than our old tables told us it could. This is especially true with 7 to 9 wires #14 to #8 in one conduit, and holds good all down the line with the bigger sizes of cable. In the smaller sizes the current ratings are all too low to be of any value, especially so in rewiring work. In the larger sizes the current ratings are so far out of line, that to use 50° cable would necessitate the use of much larger and more expensive conduit and condulets. The cost increase would be prohibitive and is entirely unnecessary because 60° or 75° C. cables can and should be used. It is my opinion that the newly proposed 50° code grade rating for wires and cables should be entirely eliminated.

Let us consider next the 60° wire table. For the smaller sizes, #14 to #8, current values for 1 to 3 wires in a conduit do not mean much in a practical way, for if we are to use thin-wall insulation we would likely have over three wires in a conduit. And if we have only three wires in a pipe that will later take 3, 4, or 5 more wires, then the current value for the ultimate maximum number of wires in that pipe must be used. I do not understand how we can have one current rating for #14 wire with three #14's in a conduit capable of accommodating only 3 or 4 such wires, and another rating for 3 #14's in a larger conduit capable of taking 3, 4, or 5 more wires at some future time.

The inspector cannot come back every six months to count wires and adjust fuse ratings accordingly. It should be noted that even the 60° wire has current values in practically all cases less than we have been using, except in the 1-3 wire column, indicating again that we have been wrong in our figuring.

Passing on to the 75° table, let me repeat that whether we use standard thickness or thinwall insulation on conductors, we must consider the worst possible condition to be met with in practice. The Edison Electric Institute proposals contemplate loading conduits on rewiring jobs to the maximum per-

missible, and I find no fault with that proposal. It does mean, however, that we must consider only the current values shown for 7-9 wires in a conduit and regard these as the only values for #14 to #8 wire sizes. We cannot have one current value for 1-3 wires, another for 4-6 wires, and still another for 7-9 wires. There should be but one rating, and that based upon the worst condition to be met.

Therefore, I have prepared "Table B" as my recommendation for adoption as a simplified table of carrying capacities. The current ratings for 75° wire from sizes #14 to #1 are identical with

Wire Size	1937 N.E. Code	60° Wire 1-9	75° Wire 1-9
14	15	10	15
12	20	15	20
10	25	20	25
8	35	30	35
6	50	50	60
4	70	60	70
2	90	80	90
1	100	90	100

present ratings except that #6 wire is raised from 50 to 60 amperes. This is a good thing, practically, as we can then use #6 wire for full 60 ampere capacity on a sixty ampere switch and use only one inch pipe. The values of #14 to #8 are based on the 7-9 wire figures, while values for #6 to #1 are based on the 4-6 wires in a conduit figures. Furthermore, these figures have the great additional advantage of corresponding very closely to those every contractor and journeyman has memorized for years.

If we must have a 60° wire, I suggest use of the column shown in Table B, with values five amperes less than for 75° wire in sizes #14 to #8, and ten amperes less in sizes #6 to #1. Such wire could probably be made of a different color or with some distinctive and easily distinguishable marker to identify it from 75° wire, but its use would still present a problem in fusing and overheating of insulation, if a mixture of these wires were in one conduit.

While I advocate the adoption of a single current carrying value for sizes #14 to #1, I am showing in Table "C" three different ampere ratings for cables from 1/0 to 500,000 C.M. There will be many feeders and services where not more than three such cables will be in one conduit. However, the current values for cables over 500,000 C.M.

are so low and the increase in ampereage from one size to the next larger is so small, that I suggest stopping with 500,000 C.M. cable and using two or more in parallel to get the desired current carrying capacity. This would mean better electrical service to the customer at lower initial cost, and would also cut down manufacturers and jobbers stocks on expensive large cable.

Because of parallel connection of cables, I have shown columns for 4-6 wires to take care of 3 wire three phase, and 7-9 wires to handle 4 wire three phase jobs, etc. Current values for 1-3 60° wires are all less than present values, becoming much less as the cable sizes increase. In the 4 to 6 and 7-9 wire columns, the ratings are so low and would require so much larger a conduit, that 75° wire would be better.

From the preceding it is clear that the wire and conduit sizes for any feeder or service must be determined by the number of wires in the conduit, the current carrying capacity of 60° and 75° C. wires, and a comparison of costs between 60° wire in one size of conduit, and the more expensive 75° wire in a smaller size of conduit.

Everything I have said so far applies to insulated wires of Code thickness. What about thinwall insulation? There is no reason to assume that we are, through long usage, necessarily committed to the continued use of rubber as an insulating medium on building wire. If new developments come along with rubber or something new containing no rubber at all, there is no reason to look askance at the new product.

It is as though we were to order the engineers of some wire manufacturing plant to develop an insulation not of three sixty-fourths, but rather of two sixty-fourths inch insulation, and still capable of meeting Underwriter's specifications and tests. Apparently that has already been accomplished by several large wire manufacturers, and the new product not only meets, but in some instances exceeds the insulating properties of the old rubber covered wire. The immediate advantage will be in the use of thinwall wires in rewiring work to get more wires into an existing conduit, or to replace #14 with #12 wire, for example. See Table D.

I see no objection to permitting 50%

(Continued on Page 34)

Wires in one Conduit						
		60° Wires			75° Wires	
		1-3	4-6	7-9	1-3	4-6
1/0	125	125	100	90	150	120
2/0	150	145	115	100	175	135
3/0	175	165	130	115	200	155
4/0	225	190	150	135	225	180
250	250	210	170	150	250	200
300	275	235	190	165	275	225
350	300	260	200	180	300	250
400	325	280	225	195	335	265
500	400	320	250	220	375	300

OVERALL DIAMETERS OF RUBBER COVERED BUILDING WIRES						
Copper Size A.W.G.	1922 Standard Handbook for Electrical Engineers	1935 Safecote Specifications	1937 Nat. Elec. Code Table 61 Area Dia.	1939 Dilec Area Dia.	Rubber Thickness	
14 sol.	.208	.196	.031—.200	.027 = .181		3/64
12 sol.	.225	.213	.038—.220	.032 = .201		3/64
10 sol.	.246	.240	.045—.240	.039 = .222		3/64
8 sol.	.273*	.297	.071—.301	.062 = .281*		4/64
	D.B.	S.B. D.B.	D.B.	S.B. D.B.		
6 str.	.410	.352—.377	.13—.407	.10 = .336—.364		4/64
4 str.	.486	.407—.432	.16—.452	.13 = .387—.417		4/64
2 str.	.588	.468—.493	.21—.518	.17 = .448—.478		4/64
1 str.	.655	.538—.573	.27—.587	.23 = .518—.548		5/64
		S.B.—Single Braid.	D.B.—Double Braid.			

* Table 6 of N.E.C. gives area only. Above gives calculated equivalent diameters. * 3/64" rubber wall. Code was changed to require 4/64" in 1933.

Equipped for Color Matching

The First Large-Scale Installation of Carbon-Dioxide Lamps Helps Dye-House Experts Match Yarns in Rug Making

NEARLY right won't do in carpet colors. With heavy investments in new designs, supported by promotional literature and costly color aids in many home magazines, color-minded experts are responsible for producing dyed yarns in hues that are accurate and uniform. The rug colors must be in keeping with those created by the company's artists. And extremely accurate yarn dyeing must go on day in and day out, regardless of clouds, glaring sun and night-time shifts.

To simplify the color control problem at six important places in its Yonkers, N. Y., plant, the Alexander Smith & Sons Carpet Company recently installed eleven 625-watt carbon dioxide "day-light" lamps at a cost of about \$3850 for equipment and wiring. These units have already met with favorable acceptance among the company's dye experts. It is yet too early, however, for definite statements to be had from the executives, who pioneered this sizable investment.

The incentive for making the installation was uniformity of product, unrestricted production at all times of day or night, and relief from eye strain. And the plant experts appraise this new development by its effect on operations, rather than first cost.

Colors were formerly compared in this plant by daylight, and then only when daylight was adequate. No matching could be done with accuracy on dark days or at night. The new carbon-dioxide lighting is expected to give uniform seeing conditions in every department at whatever time a particular sample or batch is to be checked against the company's color standards. So



eleven lamps were located in these places:

Axminster Design—Colors selected here for new rug designs.

Velvet Design—Colors selected here for new rug designs.

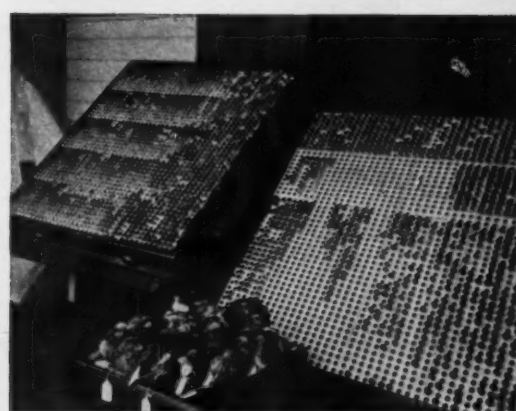
Yarn Room—Where colorists compare production against standards.

Axminster Setting—Where left-over bobbins from preceding runs are stored and matched for use on subsequent orders of exact colors.

Dyeing Department—Where freshly dyed batches are compared, against color specifications.

Color House—Drum Dyeing—Close control needed for matching colors to standards.

The carbon-dioxide lamps used at this plant are pyrex glass tubes containing carbon dioxide gas and operated with a transformer. These tubes draw 350 milli-amperes with a 5000-volt transformer. They are 15-feet in length, and are bent to form a grid-shaped



1. EYE ASSURANCE—Barkon-Frink carbon dioxide lamp booth, as used in the Axminster rug design department for matching colors of new rug creations.

2. UNIFORM PRODUCTION—This colorist in yarn room selects approximate colors by daylight, then turns to the matching booth for final color selection.

3. COLOR STANDARDS—Hundreds of master color specifications are filed in trays. These samples, guide design and production and must be duplicated in all dye processes.

luminous light source. Mounted in color matching booths or boxes, 22-inches above the work plane, they produce from 60 to 65 foot candles of artificial daylight on the bench top. A working intensity of 120 foot-candles is obtained in the normal plane at which yarn swatches are matched. The transformer is mounted beneath the bench, with controls at the side.

Here then is another ambitious attempt to solve industry's seeing problems with a new artificial light source. Once more science has produced a new tool for making visual tasks easier and less subject to the variations of natural influences.

SELL the SERVICE

A calculation of what the electrical industry loses through service inadequacy in residence installations.

EVERY house should have a service sufficient to provide for anything electrical that may be wanted in the future. Why not sell it when the house is built?

This question has long been bothering me, for I believe that to install a 30-amp. residential service practically destroys the future market for heavy-duty electrical appliances. So I went to work to analyze the possibilities for a standard packaged service capable of serving all electrical needs of a residence during its entire lifetime.

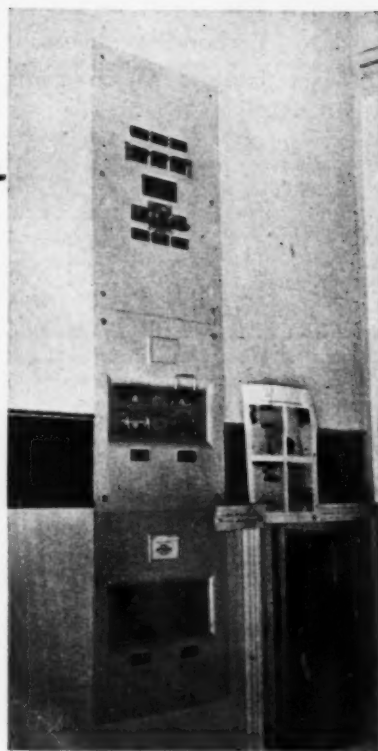
Only one-story residences up to 2,200 square ft. of floor area were calculated. These were divided into: Group I, up to 600 sq. ft.; Group II, 600 to 1,500 sq. ft.; Group III, 1,500 to 2,200 sq. ft. Calculations for switch, wire and panel board sizes were based on the 1937 Code, Los Angeles County ordinance and typical utility metering layout. Average prices were based on current market quotations on materials in Los Angeles and NECA labor cost data with a 30 per cent mark-up on

prime cost. This was taken as the basis.

A typical house in Group I, adequately wired, will contain eight convenience outlets, ten light outlets and the usual complement of switches. Service required will consist of three No. 8's in $\frac{1}{2}$ -in. conduit, a type S meter socket and all-in-four panel, and a ground. This can be installed and sold to the customer at an average price of \$20, in that region. Besides the two circuits in use, it provides a bell transformer circuit and one spare 1,500-watt circuit for future load.

According to Section 2351a of the 1937 Code, a standardized service No. I could be installed instead, consisting of two No. 1 and one No. 4 RC conductors in $1\frac{1}{2}$ conduit, a type S meter socket and a flush indoor circuit-breaker type load center 9 by 11 in. in dimensions, containing two 50-amp. double pole breakers and one 25-amp. double pole breaker nipped to a ten-circuit flush panelette. No main switch would be required.

The panel will accommodate the four



ADEQUATE CAPACITY—Compact 225-amp. No. 3 type service, employing all multi-breaker switches, installed in the Matchless Electric Home of the Electrical Development League of Southern California at the home show now on display for a year in Los Angeles. Photos of contrasting assemblies of old style externally operated switches are shown alongside.

BY SELLING THE 100 PERCENT SERVICE

at the time a house is built these benefits come to the industry—

1. Obstacle of wiring inadequacy removed.
2. An "installed" price on heavy duty appliances, fair to the contractor. (It would be simple to estimate an "installed cost" by measuring the distance in feet from the service to the appliance at a fair price per foot, since the service would not need to be considered.
3. The market for every use of electricity increased.
4. Service calls for fuse burnouts or inefficiently operating appliances reduced.
5. Customer gets a full dollar's worth of electricity for his money.
6. Cost bugaboo removed from appliances and their sale promoted.
7. Long-time, overall cost of selling adequate wiring reduced.

original circuits and six spare circuits sufficient for complete room heating. One 50-amp. breaker will serve the panel. One is held in reserve for a future range. The 25-amp. breaker will serve a future water heater. This reserve capacity is made available for future extension by stubbing in an empty 1-in. conduit and an empty $\frac{1}{2}$ -in. conduit from breaker panel to below floor level, and two empty $\frac{1}{2}$ -in. conduits from the fuse panel to the same location.

All this equipment installed complete can be sold for about \$57. The differ-

E100 PERCENT

By C. A. Rowley

Los Angeles electrical engineer and former Pasadena electrical contractor.

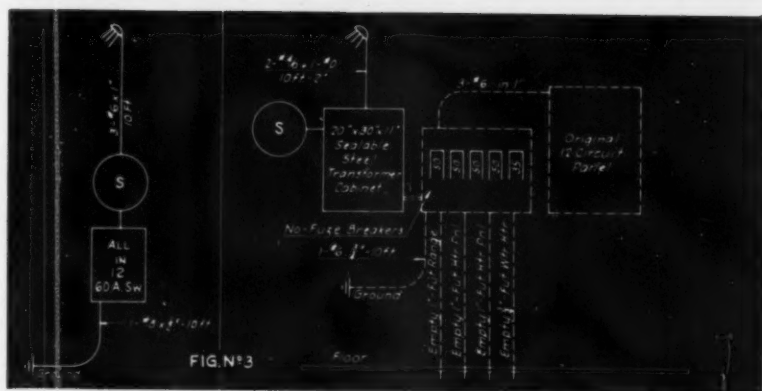
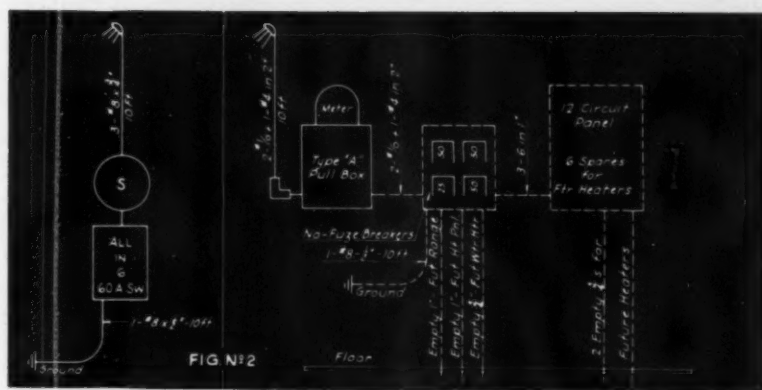
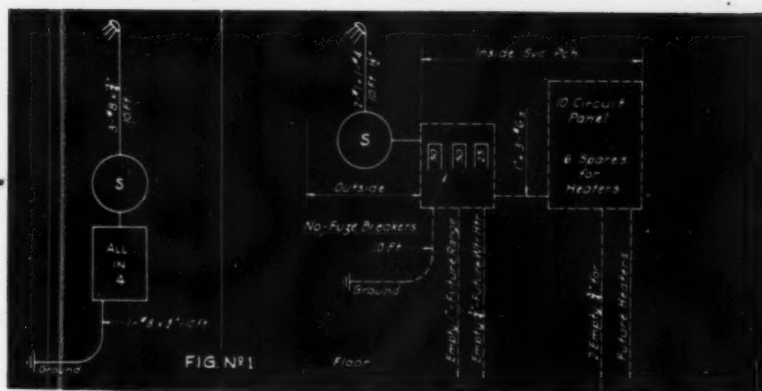
ence in first cost, therefore, between the totally inadequate service and the 100 per cent adequate service is \$37. Even as a lump sum this is not a big selling job considering its future advantages and savings. Spread over the 20-year FHA contract it is small, almost insignificant.

To the industry, here is what is lost by this lack of a \$37 investment, or gained where it is made: one range (\$125); one water heater (\$80); four room heaters (\$175); extra wiring (\$60)—a total of \$440 per house. Potential kwh. sales destroyed or gained annually: range, 1,200 kwh.; water heater, 3,600 kwh.; room heaters, 2,500 kwh. Even at 1 cent per kwh. this potential loss amounts to \$73 per house. Apply this to the total number of new minimum services installed each year and it is a sizable gain or loss.

The difference in selling price between the ordinary and the standardized 100 per cent service assembly for Group II houses is only \$45. For Group III, because of current coils and transformer cabinet, the difference jumps to about \$64. (See diagrams 1, 2 and 3.) But potential sales and revenue for Group II are: service, \$45; merchandise, \$730; annual revenue, \$130. For Group III, the potential business is in the same proportion.

With these "standardized services" the architect has no difficulty in specifying adequacy. He needs only to know the square feet of floor area. The owner can be given a definite reason.

How much better to put enough more effort into the original selling job to eliminate later the much more difficult job of selling rewiring along with the current consuming equipment! Why not completely remove the "bottle neck" to future sales?



PROPOSED 100 PER CENT SERVICE—Fig. 1—Typical 30-amp. service assembly, and at right, the proposed No. 1 service assembly for 100 per cent service for residences of under 600 sq. ft. Fig. 2—At left a typical 60-amp. service in thousands of residences of 600 to 1,500 sq. ft., and at right the

proposed standardized service No. 2. Fig. 3—Typical 12-circuit, 60-amp. service in homes of 1,500 to 2,200 sq. ft. and the standardized Service No. 3 which would provide service capacity for any and every future use, including house heating and air conditioning.

Questions and Answers on Fluorescent Lamps



ANOTHER USE—Here a fluorescent strip over the service counter brings new distinction to a cafeteria. And so this idea marches on—as complete installations, accessory features, special applications.

By Dean Warren

Nela Park Laboratories
General Electric Company

per watt. For this reason the rated light output values are based on readings taken after this initial loss has occurred. After 100 hours the depreciation is quite gradual so that even at 1500 hours the light output is still better than 70% of the rated value. Since the output from new lamps is considerably greater than published values, foot-candle readings taken shortly after making complete installations of new lamps may be much higher than the illumination level designed for.

Q. What happens when the auxiliary fails?

A. The most frequent type of auxiliary failure is open circuiting which usually occurs from connection to too high a line voltage or from wrong connection of the leads. There is no reason to expect failure in a unit installed and operating properly with rated supply voltages. It is very unlikely that the auxiliary will burn out in such a way that all or part of the choke is shorted. But if it should, the current overload resulting from the reduction in reactance would probably result in injury to the lamp and switch. It is probable that the short would burn itself out resulting finally in an open circuit. The only effect on the other lamps on the circuit would be a momentary low voltage. Since there is no fuse or cut-out on the auxiliary, there would also be a possibility of blowing the line fuses.

Q. How does the variation of the supply voltage affect the operation of the fluorescent lamps?

A. With fluorescent lamps voltage regulation depends on the choke used and not on the starting mechanism. With a small, low priced choke, such as is used in the thermal auxiliary a 2 per cent to 3 per cent variation in lumens will result from a 1 per cent change in volts. But the use of a higher qual-

(Continued on Page 34)

BECAUSE the fluorescent lamp is a comparative newcomer to the field of lighting, the following questions and answers may serve to clarify some points on its characteristics and operation.

Q. What affects the life of the lamps?

A. In general, fluorescent lamps lose their usefulness because of decrease in light output before they fail to operate. Darkening of the bulb occurs because of the effect of mercury on the fluorescent coating and because of the material given off by the electrodes. The latter especially causes darkening at the ends of the bulb late in life. The rate of depreciation in light output diminishes throughout life; the first hundred hours produce about as much darkening as the following 1000 hours. Rated output is based on conditions after the first 100 hours.

Frequent starting of lamps may take more life out of the electrodes than long hours of burning because momentarily there is a higher than normal voltage drop at the electrodes which sputters or evaporates off the active material. If a lamp is started once a minute, for

example, the hours of burning will be shorter than normal, but if it is turned on and burned continuously its life will be longer than normal. When the active material on the electrodes is used up, the voltage required for starting and operating becomes too high and a lamp is then said to have failed.

Q. Does age affect the starting of the lamps?

A. When the active material on the electrodes is nearly exhausted, the voltage required for starting will rise and may equal or exceed the available supply. This may occur after the lamp has been started thousands of times or burned beyond its rated life. Sometimes the end of life is indicated by the lamp flashing momentarily and then going out.

Q. What is the rate of depreciation of fluorescent lamps?

A. During about the first 100 hours operation, the light output from fluorescent lamps drops more rapidly than any other similar period through life; the decrease varies with different colors and may be as much as 2 to 4 lumens

stretched out,
 just havin' lots of fun
 these horizontal
 contacts prone,
 can't shake the dirty hum.

try and roast.
 That is their sordid fate.
 Had they been built
 to work upright,
 A longer life they'd rate.



VERTICAL CONTACTS mean better
 motor control. Dust between con-
 tacts causes heating and burning. But
 it can't settle on VERTICAL con-
 tacts. So Cutler-Hammer VERTICAL
 CONTACTS need not be buried. They
 lie out in the open . . . always air-
 cooled, easily inspected, fully acces-
 sible—yet free from dust and dirt. Get
 the facts. Send for free book, "Dust, the
 destroyer." CUTLER-HAMMER, Inc.,
 Pioneer Electrical Manufacturers, 1306
 E. Paul Ave., Milwaukee, Wisconsin.

**ONLY VERTICAL CONTACTS
 CAN BE DUST-SAFE!**



Editorials

Earl Whitehorne, Editor

Philadelphia Convention

It is easy to say—"This is the best convention we've had." But it has to be good to make you feel that way. And that's the way it was in Philadelphia at the NECA meeting. The program was strong in interest, rich in ideas, vigorous in its plain talk.

Everybody seemed to feel that the Labor Relations Committee has proved the soundness of the change in NECA's policy. For the importance of labor in this business cannot be ignored. Frank cooperation is needed and E. C. Carlson has made a fine start with his committee.

George Andrae's two fisted handling of the Code situation is also stimulating. And the resolution, to call an industry conference to study the possibilities of a broad campaign to cut out the waste caused by the burden of excess and duplicating varieties of electrical wiring materials and equipment is a timely, intelligent and courageous move.

Earl Peak retires with the gratitude of contractors everywhere. He has been a hard working president, who kept on for four years when many would have quit. Bob McChesney comes in under good auspices, with many problems but the confidence of the entire industry is behind him.

What Other Costs?

It is hard to understand why the men who speak for the power companies on their so-called cost-of-wiring campaign continue to build up resentment among contractors. It loses them friends who might be very useful both nationally and at home.

At the League Convention, the president of EEI again stated that "the cost of wiring holds back the progress of the electrical industry". It is an

assumption for which no proof has been developed. It was reported at the NECA meeting and more than one speaker raised the point, that an assumption that the cost of current also holds back industry progress might be argued with equally good effect. It is a natural reaction.

But this gets us no where except further into the fight. Isn't it about time that the entire electrical industry faced this thing? Why don't we sit down—all branches—and see what can be done to cut out the excess cost and waste wherever it may be?

On the Chin

For those who think the electrical contracting business has been all beer and skittles, these figures cited by Norman Pierce will be of interest. They cover the money paid to labor by the Chicago Electrical Contractors group for the months of December, January and February 1931 to 1939.

Year	Total Paid-3 Mos.	No. Men	Wage Rate
1931	\$1,546,877	1805....	\$1.70
1932	1,084,239	1265....	1.70
1933	257,220	340....	1.50
1934	232,016	307....	1.50
1935	293,862	388....	1.50
1936	327,307	432....	1.50
1937	517,705	684....	1.50
1938	415,410	485....	1.70
1939	546,660	638....	1.70

Cost-Price-Profit

Fine appreciation and strong interest was expressed for George Patterson's splendid work on Labor Units. No matter how contractors neglect their estimating, George keeps on building up the NECA Manual—and it is not in vain. A growing use will be his reward.

For as Walter Collins puts it—"Estimating a job is doing it mentally. If you can't do it mentally, how are you going to do it physically?" A vital statement—for on our skill in estimating hangs the whole prosperity of this wiring business.

Beyond the Hills

Speaking of markets, two men revealed before NECA two bits of future possibility. Lee Moore pictured 130,000 accessible frame houses in the cotton belt that cannot pay more than \$40 to get electric service. REA is going after them with 600 watt services. J. F. O'Brien, of the Pierce Foundation, showed us a \$2000 modern house, well wired with quality materials.

It is not new markets we need. It is new thought—a look beyond the hills we've settled down in. These markets have been waiting a long time.

More than Mere Price

Hope and fear are poor bases for estimating a wiring job. But as O. V. Scott of Miami said before NECA, the too frequent practice is to add on profit when you sell a friend and cut it when the customer is tough. But that isn't selling.

The man who uses standard labor units, however, and backs them with his own recorded labor data has something real to sell. This organized experience, proves both his knowledge and responsibility. With it he builds a reputation that makes his work mean something more than a mere price.

Better Floodlight Wiring

Two big floodlighting jobs for night baseball have recently been completed in the major league. One is in Philadelphia and the other in Chicago. Night baseball is proving even more popular than the day game.

Particularly heartening to the electrical contracting industry is the top quality wiring that has gone into these two jobs. Substantial copper, individual circuit fusing, substantial weather-proof conduits and fittings, well protected high tension feeders and remote control switching are some of the features.

Too often the outdoor floodlighting job gets the cheapest wiring possible. The lights are all important, and the wiring a kind of necessary nuisance. In the big league parks, however, the lighting and the wiring systems were engineered as a unit, each part equally important.

Major league ball club managers are shrewd business men and they know floodlighting is expensive business. Where trouble free operation is as important as it is in professional sports lighting, the best is the cheapest at any price.

Bigger House Wiring Firms

At the Regional Adequate Wiring Conference in Chicago, J. W. Collins, of the Chicago Electrical Contractors Association, tossed in the bombshell. He said that better wiring at lower cost would be possible if the big electrical construction organizations could be drawn into the house wiring business.

Contending that these larger organizations work on half the overhead of small house wiring contractors, Mr. Collins pointed out that this saving to the consumer could be converted into more wiring.

If he is right, that a concern geared to handle \$10,000 jobs can handle \$200 wiring jobs with equal overhead economy, by all means let's have a practical test. Our industry's future waits on the answer. *

Part of the Job

At one of the recent IAEI meetings, an inspector described the careless contractor who takes a rural wiring contract and rides out in the morning unprepared. He runs short of fibre bushings, cable connectors, nipples, tape and boxes. But it is so far to the shop, he finishes the job without 'em.

The inspector spots the violations and calls him back. And so again "there's no money in rural work." But preparation for profits is an important part of every job.

Collusion

Thurman Arnold's investigators are searching cities for evidences of collusion in the building industry. Their

eyes are peeled particularly on residential construction.

House wiring contractors will get their share of investigation, solemn interviews and such. Then voluminous reports will be prepared—complicating the stark realities of the business into the verbiage necessary for assimilation by the legal mind.

Blessings on thee—G-man! There are divine mysteries you may be able to solve for all of us. For instance:

1. How do some house wiring contractors carry a 33 per cent overhead on a 15 per cent mark-up on labor and material?
2. Why do some contractors carry on a business from which they take less personal income than the wages they pay to a mechanic?
3. Why do some contractors take a job at a loss rather than see a competitor get it at any price?

What the house wiring business needs is primitive mutual confidence, general appreciation of fundamental business principles plus a planned co-operative attack for a bigger share of the building dollar. Mr. G-man—it is our fond hope that somewhere, sometime, you will find this kind of collusion.

Just As Soon

In a recent check of 1000 residence jobs, Earl Peak reported only 15 per cent had been done by what we so glibly call "legitimate contractors." But America is still a country of free opportunity. And if strong, efficient, responsible electrical contractors do not organize to do this work, why naturally the mail order houses will sell the material and some Johnnie with a screw driver and pliers will put it in.

"Legitimate contractors" can do this business just as soon as they work out less expensive mass production methods and sell themselves to the public and Johnnie Pliers will be glad to take a steady job with them.

Back Talk

Still Normal

To the Editor—"I have just read your poll on the code proposal. On the question of bare neutral, most opinions are worth very little because we do not actually know what the results of its use would be. The matter should have unbiased engineering study. If it is not safe I am against it regardless of its cost or the effect it may have on the future of wiring.

"I am in favor of reducing unit costs of electrical distribution systems, if and when it can be done to the ultimate benefit of the consumer. For only in that way will we ever progress to any marked degree.

"As to thin insulation wire, the Underwriters Laboratories should determine what kind and thickness of insulation should be put on the copper. The contractors do not know and consequently have no right to argue the question. I am very much interested in the results you obtained in your poll. It shows that the contractors are still normal—unable to agree on anything."

D. B. Clayton
Birmingham, Ala.

You put your finger on it, Don. The use of bare neutral or the loading of more conductors in conduits is not a matter to be settled by opinion but by engineering study and experience. Why shouldn't questions of this kind be settled by accelerated life tests made by Carnegie Institute, for example? This would give us real data to work on.

A Direct Reflection

To the Editor—"I am interested in your checkup of the attitude of electrical contractors toward the proposed changes in the National Electrical Code. Your editorial was spicy and to the point. The tabulation of the ballots is interesting. It shows individual thinking.

"You have developed the only direct reflection of the attitude of individuals in any of the interested groups. Your poll will be helpful not only to the contractors' representatives on the Electrical Committee, but to all of us who have to study and vote upon the proposals of the Light and Power Group."

Robert B. Shepard
Underwriters' Laboratories

Your comment on the value of an individual expression is interesting. We certainly agree with you. It is too easy, somehow, to let a committee give the answer, too hard to find out what other people really think. But when you do, you know.

Education Progressing

To the Editor—"Your poll among contractors proved very interesting. You are to be congratulated for your original methods in breaking down the wall of conflicting viewpoint, which seems to exist between the trade and the utilities. But, as you have often pointed out, there is actually no conflict of interests.

"I feel that the opposition vote reflects the closed mind which has always been the greatest obstacle. The reasons given, for opposing, are the same unchanging arguments which have always been advanced against improvements in wiring practice.

"We believe that these objections have all been answered by those sponsoring the use of new materials. The substantial number of contractors who favor the proposals is evident that these answers are sound and convincing to all progressive, thinking contractors.

"The problem demands education of contractors to recognize the qualities of the new material and how its use will benefit them. I think your poll shows this education is progressing and I am sure your efforts have had considerable effect along this line.

"It would be a fine work if *Electrical Contracting* could pick up the torch of progress now being borne by the minority group and forward it until the great majority of contractors have registered their votes with the most progressive members of the industry."

H. H. Tillman, Manager
New Business Department
Consolidated Gas, Electric Light & Power Co. of Baltimore

We too hope that thin wall insulation will be approved, also the increased use of conduit space. We are not convinced that bare neutral is safe or that it offers any important economies. It has all been argument so far. No real case had been made for it.

We are eager to see the art advance. But public safety should be the paramount interest and we should be pretty sure of safety before we lower any of the standards.

WIRING

Methods

OUTDOOR FLOODLIGHT TERMINALS

Weather-proof terminal boxes with threaded hubs and enclosed fuse cut-outs were employed on the Comiskey Park floodlighting job in Chicago by the Henry Newgard & Co., electrical contractors. Each terminal box serves two 1500-watt floodlights.

A through feeder of three number six



WEATHER-TIGHT boxes enclose individual fuses and provide terminals for floodlighting system.

conductors in one inch conduit feed each three cut-outs. From each cut-out terminal a heavy duty rubber cord is carried through a packing gland connector and extended to the floodlight hood. Access to the boxes is made through weather-tight covers which may be reached from tower catwalks.

LIMIT SWITCH CONTROL ON PAPER PRESS

The California Electric Works Ltd., of San Diego, recently installed a system of limit switches on a printing press of the San Diego Sun Press. These switches, located at various points, protect the machine against damage and delay, if the paper breaks.

The switches have arms equipped

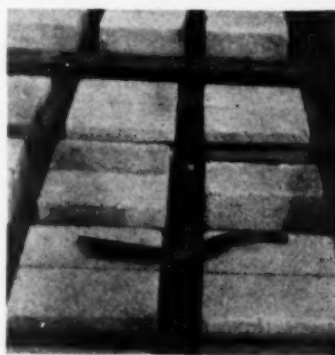


LIMIT SWITCHES for safe operation of a printing press. If the paper breaks, the arm drops and stops the motor.

with a shoe which rides the paper as it threads through the press. If the paper breaks, the switch arm drops stopping the press immediately.

PRE-BENT CONDUIT

Short scrap pieces of conduit, bent into the proper shape, are used to enter outlet boxes on a pre-cast block type of floor construction. One piece of conduit is bent to accurate measurements and used as a pattern. Then as many identical bends as are necessary can be accurately made on a



PRE-BENT CONDUITS, made from short scrap pieces, ready to be used for outlet boxes.

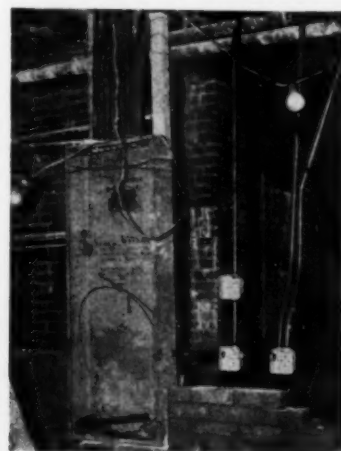


SPIDER WEB of conduits in a pre-cast block floor installation. Arrows point to pre-bent pieces.

conduit bender, to supply the needs for work on the next floor. These pieces are used to duck in and out of outlet boxes, while the interconnecting straight lengths are cut to fit. By doing this the Garden Electric Company of Elizabeth, N. J., saves both labor and material.

SUPPORTING CONCEALED WORK

Numerous methods of supporting panels and outlet boxes in concealed locations are used by various contractors. This inexpensive yet sturdy method was used by the J. S. Nielson Electric Co., of New Haven, Conn.



WOOD SUPPORTS hold panel rigid while conduit work progresses, nipple to panel keeps outlet boxes rigid.

The lighting panel was supported by two wood uprights extending from the floor to the ceiling. All conduit work could then be completed before the wall was built around the supports.

THE SMALLEST DIAMETER WIRE EVER MADE

(No. 12 Smaller Than Old No. 14)
Also 10-8-6 and other sizes
proportionately smaller



- (1) Fishes 40% Easier
- (2) Hard Flexible Smooth Slick Finish
- (3) Never Tacky - Sticky
- (4) Marked and Measured
- (5) All Colors, Neither Fade Nor Smear
- (6) Will Not Soak Up Moisture
- (7) Will Not Carry Flame

"THE FINEST WIRE
EVER MADE"

National Electric Products Corporation
Pittsburgh, Pa.

SAVE Time and Money and do a Better Job of Enlarging Holes

This message is addressed to every contractor who wants to save time in the enlarging of holes for conduit in metal boxes, panels, etc. No longer is it necessary to use makeshift methods, to file or ream. A Greenlee Knockout Punch or Cutter and an ordinary wrench are all that is required. They do the job quickly, easily, leaving a hole that is accurate and smooth. Below are shown the tools available for enlarging holes for conduit from $\frac{1}{4}$ to 3-inch sizes.

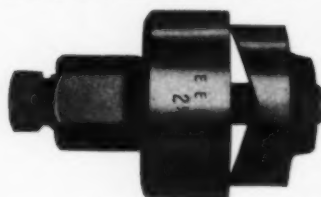
Nos. 735 and 737 Knockout Punch Sets

To the right is shown the leather case and one of the punches of the No. 735 Set. This set consists of four punches for enlarging holes for $\frac{1}{4}$, $\frac{1}{2}$, 1 and $1\frac{1}{2}$ -inch conduit. The No. 737 Set is similar, except that it consists of two punches for $1\frac{1}{2}$ and 2-inch conduit. They will enlarge holes in metal, having a thickness up to $\frac{1}{4}$ -inch, quickly and accurately, eliminating all reaming and filing.



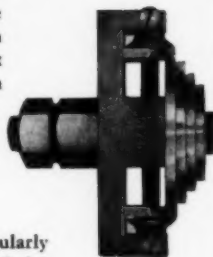
Improved Drive for $\frac{1}{2}$ -inch Punch

Above are illustrated the drive screw and nut which can be furnished to replace the cap screw ordinarily used with the $\frac{1}{2}$ -inch punch. The small thread at the end holds the punch while the nut operates on the heavier threaded section against the die. This arrangement adds to the life of the tool when cutting the heavier-gauge metals.



No. 740 Knockout Cutter

This tool is regularly equipped for enlarging holes for $1\frac{1}{2}$, 2, $2\frac{1}{2}$ and 3-inch conduit. Odd sizes of holes can also be cut by equipping it with the proper size discs. It is operated by an ordinary wrench, the cutting being done by the two wheel cutters.



Nos. 738 and 739 Punches

Because of the demand for larger punches, these have been recently added for $2\frac{1}{2}$ and 3-inch conduit. They are packed and sold individually.

GREENLEE TOOL CO.

Rockford, Illinois

Use this Coupon and Save Time

GREENLEE TOOL CO., ROCKFORD, ILL.

Please send information on the following tools:

☐ Knockout Tools ☐ Improved Drive for $\frac{1}{2}$ " Punch ☐ Conduit Benders ☐ Cable Puller
☐ Joist Borer ☐ Electricians' Bits ☐ Bit Extensions ☐ Radio Chassis Punches ☐ Pipe Pushers

Name..... Address.....

City..... State.....

My Jobber is..... E. C. 11-39



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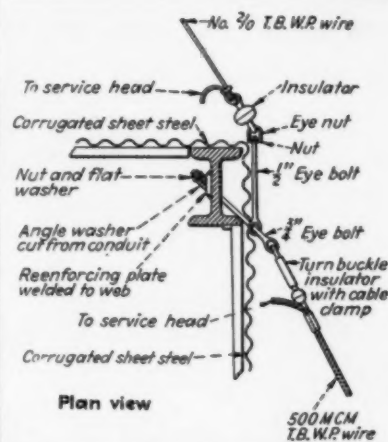
The conduit nipple, from the panel to the outlet box, gave added rigidity to the other boxes connected to it. In addition to giving support, this nipple affords a convenient entrance to the panel for additional or emergency connections, if it is not used at present as a raceway.

DEAD END FOR OVERHEAD FEEDERS

The problem of dead ending overhead feeders, at the corner of a corrugated sheet steel building, was recently encountered by W. L. Schoonover & Co., electrical contractors of Newark, N. J. To avoid making costly and cumbersome mounting brackets, they used the following method:

A reinforcing plate was welded to the web of the corner steel column. Three holes of the proper size, angle and vertical spacing were then burnt through the web and plate. Corresponding holes were punched through the corrugated side of the building. A $\frac{1}{2}$ " eye bolt, slipped through the eye of a $\frac{1}{2}$ " bolt, was then pushed in these holes.

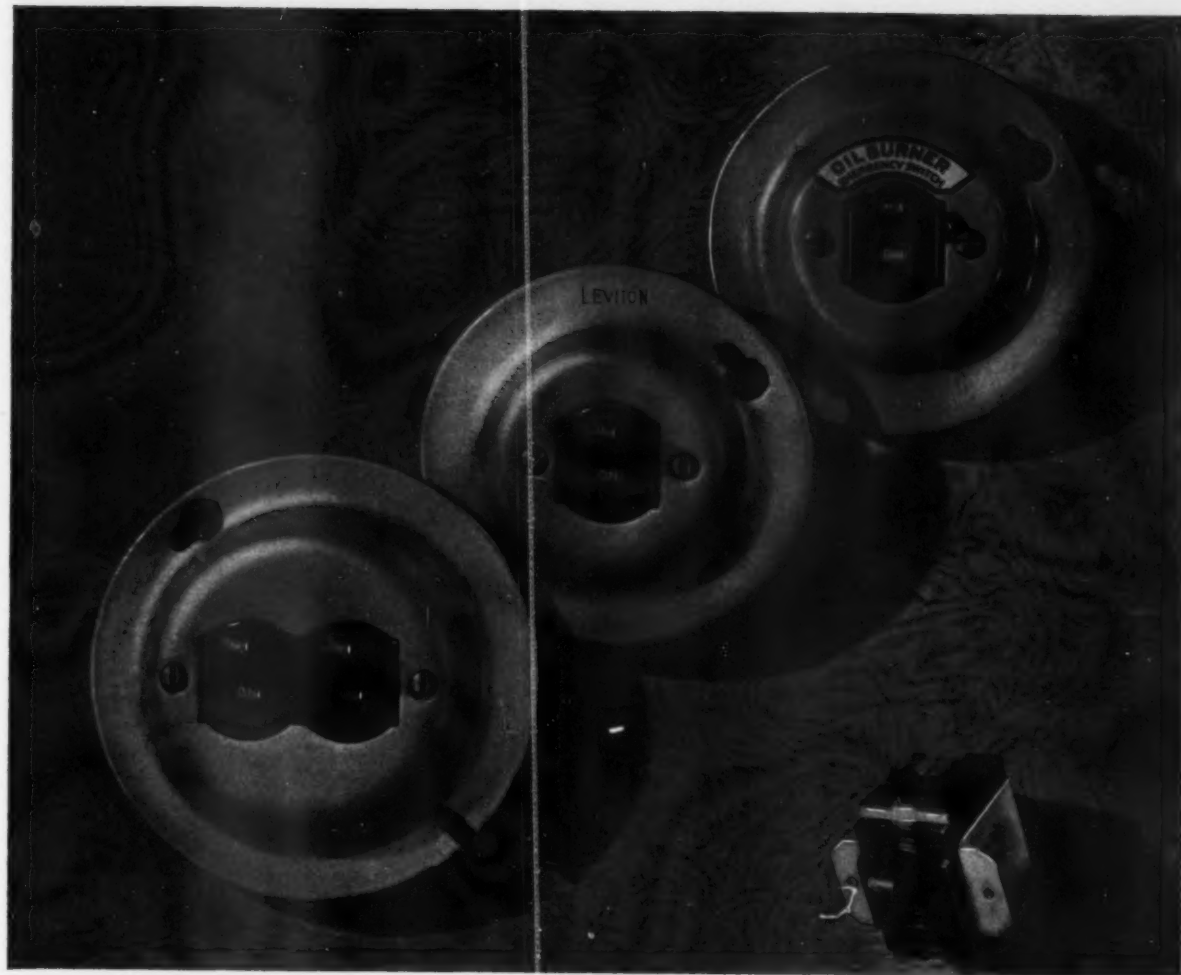
To insure a uniform shear, without a bending movement, on the bolt threads, angle washers cut from 1" conduit were



ONE METHOD of terminating overhead feeders on corrugated steel buildings.

used ahead of the nut and flat washer on each bolt. Combination turnbuckles and insulators with cable clamps were attached to the eye of the $\frac{1}{2}$ " bolt to support the 500 MCM cables. An eye nut, backed up by a second nut serving as a locknut was screwed on the end of the $\frac{1}{2}$ " bolt.

This eye nut was the means of attaching the insulator for the No. 2/0 feeder. The angle of the $\frac{1}{2}$ " bolt and the strain of the 500 MCM cables keep the $\frac{1}{2}$ " bolt in place close to the building.



THE KWIKCHANGE Line is complete with a full assortment of 3 1/4" and 4" round box covers which fit with any of the devices singly or duplex. The covers are made of approved heavy gauge steel and are processed with a protective coating of baked aluminum for appearance and for rust-proofing quality.

Note the individual assembly of the device—simple and easy to mount—yet rigidly held in place by the two screws. These units are also adaptable to fit directly on appliances or machine units or wherever outlets and switches are used for direct control or convenience.

A special oil burner cover finished in bright red and legibly marked in outstanding colors is ideally suited for this type of installation.

KWIKCHANGE Device Combinations are adaptable for every type of wiring job.

**SEND FOR OUR
COMPLETE CATALOG
OF WIRING DEVICES
for your every need.**

The **KWIKCHANGE** LINE OF WIRING DEVICES

BY

LEVITON

A full line of

MODERN and UP-TO-DATE WIRING DEVICES

QUALITY IN EVERY DEVICE

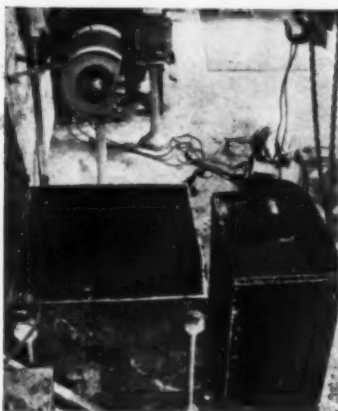
LEVITON MANUFACTURING CO.
236 GREENPOINT AVE., BROOKLYN, N. Y.

111 N. Canal St., Chicago, Ill. 420 S. San Pedro St., Los Angeles, Calif.

Motor Shops

OFF TIME SMALL JOBS

For the occasional small motor, being rewound at a time when there are no other larger motors going through, an auxiliary small dipping tank and baking oven are a good investment. California Electric Works, at San



AUXILIARY TANK used for small jobs that have to be put through, when the larger tank is not ready.

Diego, uses a varnish tank, about 2½ by 4 ft. and 3 ft. deep, and an oven about 3½ by 4 by 3 ft. deep made of sheet metal to take care of these small off time jobs. The oven is equipped with four strip heaters which bring up the temperature quickly and hold it during the baking period.

STOCK INDEX

As a convenient index to an exceptionally complete stock of motor and control parts, the William C. Krauth Electric Company of Louisville, Kentucky, uses a unique sample "catalog."

The index, covering over 8,000 parts, consists of ¼ in. beaver board "pages" 20 in. high and 18 in. long. The boards



SAMPLE CATALOG on swinging racks gives quick identification to stock of motor and control parts.

are supported vertically on butt hinges.

Samples of each part are fastened to the board with sheet-metal screws. A description tag has the manufacturer's number, name of part, apparatus it fits, stock drawer number, cost in code, and the selling price.

RACK ARMATURE

In shops which specialize in fractional horsepower rewinds, there is always the problem of where to put the armatures



RACKED ROTORS on this handy frame are safe and out of the way.

between operations. The E. T. Sharpe Company motor shop in Davenport, Iowa has solved this with a specially built rack that does the job perfectly.

Four 5-ft. lengths of 4 by 4 are supported between two uprights of 2 by 4 material. Each cross member is drilled through vertically with seven 1½-inch holes. The armatures are placed in the racks with the shaft through one of the holes. The individual armatures are thus held apart, easily accessible and secure from accidental damage.

SOME FINANCIAL ASPECTS FOR SMALL MOTOR WORK

A paper, presented by C. W. Nunn, Swanson-Nunn Electric Company, Evansville, Ind., before the last NISA convention in St. Louis, estimates the investment necessary to operate a fractional horsepower department in addition to a standard motor repair shop. These calculations do not include machinery or materials already carried in stock by the average motor repair shop not engaged in small motor work. The figures are as follows—

1. Representative stock of motor sizes and types to meet local demands for replacement and re-sale—\$800.
2. All material parts, including repaired stators and armatures—\$1,800.
3. Necessary additional equipment including a dynamometer—\$1,850.
4. The total additional investment—\$4,450.

"This analysis of our own shop," says Mr. Nunn, "is based on three years experience. Our sales last year on the repair of fractional horsepower motors was \$7,200, averaging approximately 40 percent gross profit or \$2,880. This does not include the supervisor's labor. Small motor sales were \$3,600 and averaged approximately 10 percent gross profit. Because we sold the majority of these motors to people who were able to buy motors on contract, our gross profit was held down. The \$360 gross profit on new motors plus \$2,880 gross profit on repair sales totals \$3,240.

"Assuming an overhead of 20 percent on the above \$11,000 worth of sales, we have an overhead of \$2,200, leaving a net profit of \$1,040 for the department for the year, or approximately 23 percent net profit on the total investment. There is a question in our mind, however, as to what portion of our total overhead should be applied against this department. We find that our labor cost is some two or three times as much as the material cost. If we can put on one or two men

for the less important work at a lower hourly rate, the profits will be greater. Owing to the fact that sales are down, it was necessary to keep the higher price men on the job.

"In our opinion it isn't practical to put our fractional horsepower motor business on a production basis. We have never been able to secure enough business to warrant more than three men in our fractional horsepower shop. We have found that one man taking the motor repairs straight through to completion has worked out the best for us. Should we get to the point where we have 15 or 20 motors a day going through the shop, then a mass production program will be the better system."

MULTIPLE FEEDER

Winding small motors profitably requires tooling to speed the work along, else there's no money in it. Here is a hand tool to help the winding of the armatures of small motors or generators, developed by Al Anderson, of John Mack Motor Shop, in Yakima, Wash. With it he can lay in as many as four wires at a time into the slots of small armatures.

The tool consists of two sheets of brass separated by two narrow spacer strips between which segments of copper sheet are placed. Each of these seg-



HAND TOOL facilitates placing wires into armature slots. As many as four wires can be placed in at one time.

ments is grooved so that the wire may slip through the channel made by the grooves. The segments are rounded at the tip so as to make it easy for the wire being placed in the armature slots to bend easily and without damage to the insulation.

Wire is fed into the tool through lengths of coil spring at the opposite end of the working end. Wooden curved pieces are fastened to the exterior and taped to make the tool more comfortable to the hand. Segments and feeder tubes of coil spring are held in place by set screws.

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CRESCENT ENDURITE SUPER • AGING INSULATION

Questions and Answers Fluorescent Lamps

[FROM PAGE 24]

ity choke—one with more iron as used in the magnetic auxiliary—will reduce the variation in light output to 1 per cent or slightly more with a 1 per cent change in voltage. As the line voltage goes up, the lamp voltage goes down and although the lumen output increases the efficiency actually decreases.

The reason for this is that the increased line voltage causes the choke to pass more current to the lamp, which lowers the resistance of the discharge path and results in a lower voltage drop across the lamp itself. The watts input to the lamp are slightly increased, and therefore the lumens increase, although not as fast as the watts. In this condition, however, the higher current density produces the short wave ultraviolet radiation less efficiently. Consequently, the efficiency decreases.

Lamp Life—The lamp is designed to give its best, all-around performance within the specified voltage range. Lowering the voltage will not necessarily increase the life of the lamp as is the case with filament lamps, because such treatment may place a greater burden on the electrodes, causing them to operate too cool and to be bombarded too severely. Excessive voltage causes a shortening of the life because of the more rapid use of the active material on the electrodes. Present data indicate that from the standpoint of lamp life, they should be operated within 10 per cent above and below normal voltage.

Overheating of Auxiliary—Lamp current increases with increased line voltage. This increase is about twice as great with the thermal as with the magnetic auxiliary. Thus in installations where there is danger of a marked rise in voltage—as in off peak periods where the voltage regulation is poor—the magnetic auxiliary should be used.

Q. A plant has 220-volt power load and 115-volt lighting. Will 30-watt lamps on the power circuit flicker or go out when heavy motor load comes on?

A. When the line voltage drops because of the motor load being put on the line, there will be a decrease in light output of about 1 per cent for each 1 per cent decrease in volts with the magnetic auxiliary and about 2 per cent decrease for each 1 per cent drop in volts with the thermal auxiliary. With a 230-volt circuit, there should be little danger of the lamps going out if the voltage does not drop below 200 volts. On a 208-volt circuit, the voltage could probably drop to about 180 volts.

Q. How bright are fluorescent lamps?

A. Brightness values for the various lamps at the center of the lamp normal to its axis are given in the following table. These are maximum values; the brightness decreases at wide angles from the normal or near the end of the lamp. At 75 degrees from the normal at the center or normal to the axis near the ends, the brightness will be about half the values shown.

FOOTLAMBERT BRIGHTNESS

	15-watt T-8	15-watt T-12	20-watt T-12	30-watt T-8
Warm White..	2050	1400	1350	2200
Daylight	2050	1400	1350	2200
Blue	1230	840	800	1320
Green	4100	2800	2740	4400
Pink	1370	930	925	1510
Gold	1230	840	800	1320
Red	205	140	127	188

CANDLES PER SQUARE INCH

	4.5	3.1	3.0	4.9
Warm White..	4.5	3.1	3.0	4.9
Daylight	4.5	3.1	3.0	4.9
Blue	2.7	1.9	1.8	2.9
Green	9.0	6.2	6.1	9.7
Pink	3.0	2.1	2.1	3.3
Gold	2.7	1.9	1.9	2.9
Red	0.5	0.3	0.3	0.4

The brightness of enclosing globes, which are widely used in stores, and of the glassteel diffuser, usually lies in the range of 3 to 6 candles per square inch (1350 to 2700 footlamberts). Since brightness should not exceed 2½ candles per square inch, the present fluorescent tubes should not be recommended for general school or office lighting if used exposed.

Q. Can fluorescent lamps be operated on other than 60 cycles?

A. Operation is possible and practicable on 50 cycles and special auxiliaries are available for this frequency. The lamp itself will operate on 25 cycles. On this frequency the flicker is very pronounced. In the other direction, enough high frequency—radio frequency—energy will cause the lamps to come up to fairly high output, but high frequency is a costly way to produce energy.

Q. How much fluctuation in voltage will the lamps stand without going out or failing to start?

A. Lamps should not go out as long as the voltage is above 100 volts on 115-volt circuits and above 200 volts on 230-volt circuits. Starting may be troublesome below 105 and 210 volts on 115 and 230-volt circuits respectively.

The Proposed Code Changes

[FROM PAGE 20]

raceway occupancy on old work, using not to exceed nine thinwall wires in a conduit. But let me ask, what is "old work"? Can you define it? How soon after construction is finished, does a new building become an old building, subject to different rules for wiring? Will we encourage skeleton layouts for building wiring with one outlet per bay in the new building, and come in to finish the job six months later under more lenient rules in what is supposedly then an "old building"? I do not believe we can rule between old and new, between the initial wiring or a rewiring job, but we must recognize thinwall conductors uniformly throughout.

Need Raceway Survey

I believe the entire matter of percentage of raceway occupancy is subject to study and review, for all types of raceways and all types of conductors, and I suggest that a properly staffed special committee be appointed by the interested industry groups to establish general provisions which would form the basis for calculations for tables, and develop regulations for combinations of conductors not covered by the tables. I doubt whether the conduit fill table has kept pace with wire developments.

Prior to 1930 no real attention was paid to rubber covered wire diameters or fishing qualities. During 1934 Safecote moisture-resisting, flame retarding wire was introduced. From 1934 to 1937 development work still continued, which resulted in the present Dilec-Safecote with a further reduction of diameters. What has been accomplished is shown in Table D.

Through these reductions of diameters the present #12 wire is smaller than the old #14; #10 is smaller than the old #12. It will be noted from these values that additional copper can be introduced into conduits without increasing the percentage of conduit fill over the 40% now permitted.

Furthermore, if the conduit manufacturers were to cut down the wall thickness of conduit by a few hundredths of an inch the inside area could be appreciably increased, allowing more wires (especially thinwall wires) in a conduit, without at all affecting the conduit strength. And so, in view of the above, I recommend the appointment of an industry committee to review the entire subject of raceway occupancy by conductors.

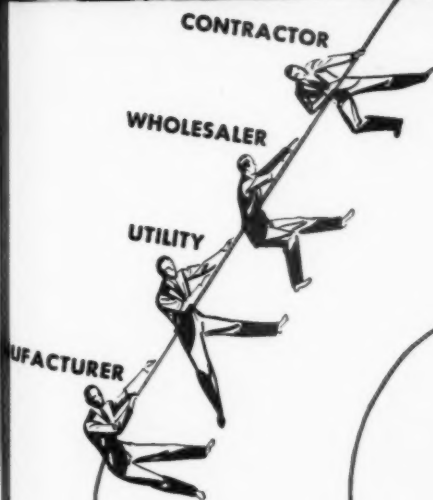
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Remove the obstacle of inadequate wiring and you open up a great new market for electrical work of all kinds. This means new installation jobs for electrical contractors . . . greater efficiency and flexibility for factories . . . load-building for utilities . . . sale of equipment for manufacturers and wholesalers.

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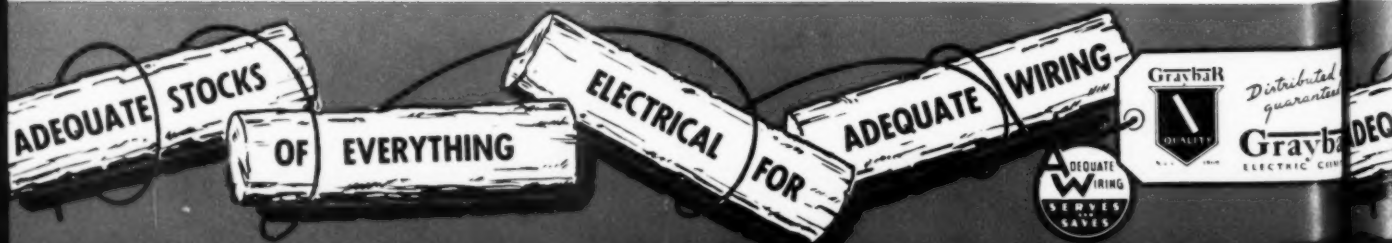
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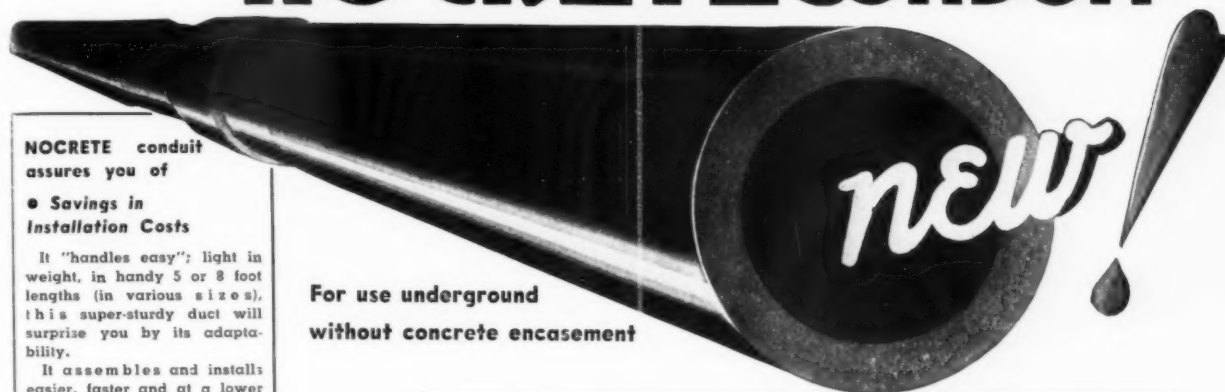
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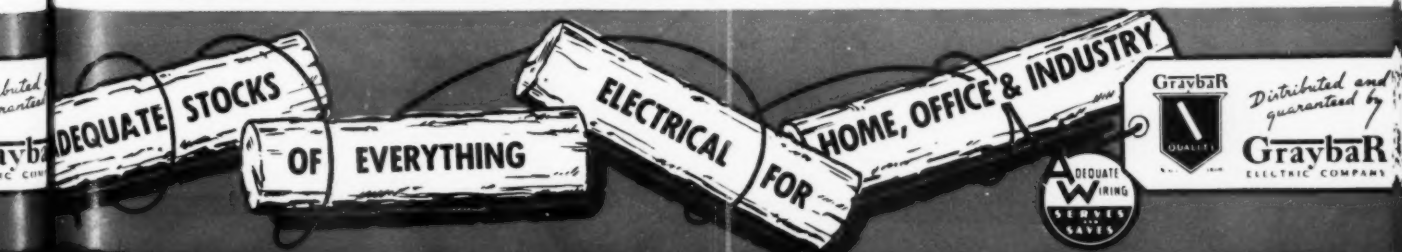
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- Holds cap from falling out.
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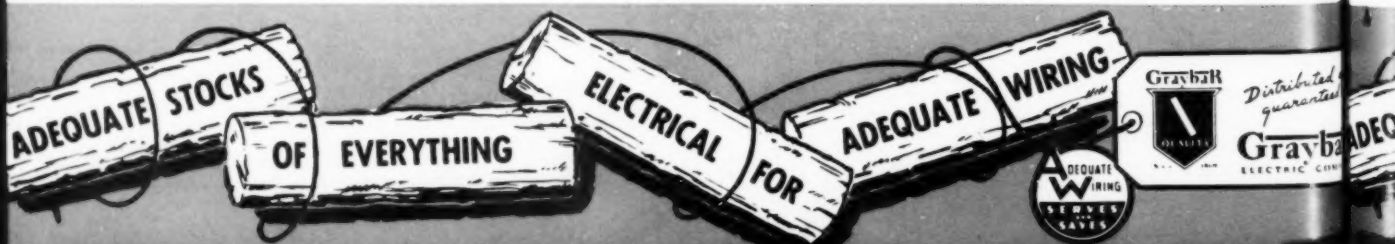
*Greetings and
Sincere Congratulations*

*to Graybar Electric Co. on its
anniversary of 70 years in Business*



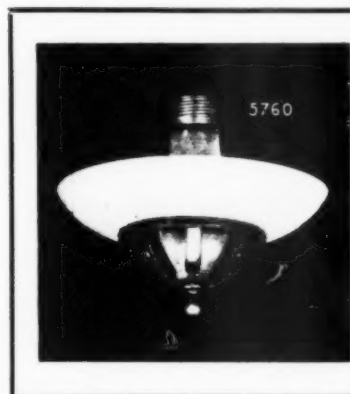
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3 NEW SILVRAY SIGHTSAVERS



A "clip-on" unit for 60 W. lamp. Perforated shield supports a plastic bowl. For multiple-socket ceiling outlets. Sells for 60¢.



6315-S. A decorative design, provides highest quality indirect lighting. Recommended for use in bedrooms. Takes 150 Watt Silvered Bowl lamp.



Screw-base unit with a swivel hamp support. Sturdy construction. Toned ivory finish. For 100 W. lamp. Sells for \$1.10.

MODERN . ATTRACTIVE . EFFICIENT . LOW PRICED

These Silvray Indirect Luminaires will build bigger lamp profits for you by selling more of the popular Silvered Bowl Type. Packaged merchandise makes stocking easy. Complete line available from Graybar.

4 NEW SILVRAY COMMERCIAL UNITS

The 207-PL Plastic Bowl Luminaire establishes a new "high" in indirect lighting. Its output is 89.5% (E.T.L.)

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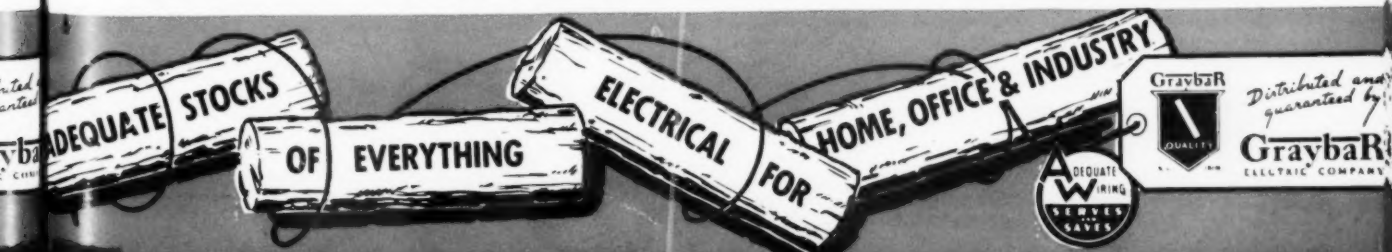
No. 207-PL. Bowl is plastic, making possible a translucent, semi-indirect appearance, for a unit itself totally indirect in operation.

No. 350-CM. Permits close mounting to ceiling, where it is impractical to recess unit. Canopy enhances appearance.

No. 350. Latest development in recessed lighting. Silvered Bowl Mazda Lamps allow unusually shallow recessed portion.

No. 3050. Special dome reflector gives both indirect illumination for general purposes and concentrated down-light for counters.

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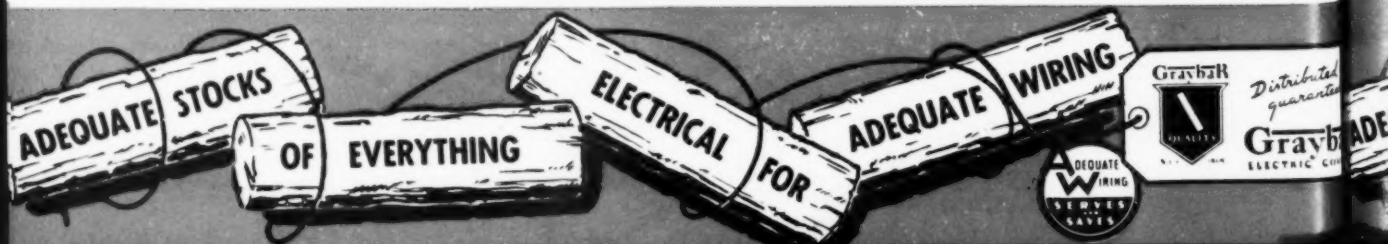
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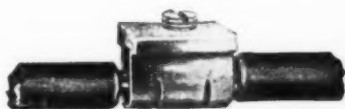
(left)

Figure
eight
double
tube



(right)

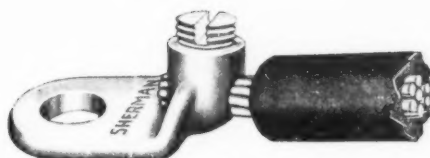
Oval
single
tube



WEDGE-GRIP CONNECTORS



SO Type
SOLDERLESS LUGS



SM Type
SOLDERLESS LUGS



SET SCREW CONNECTORS



SPLIT BOLT CONNECTORS



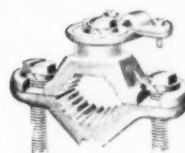
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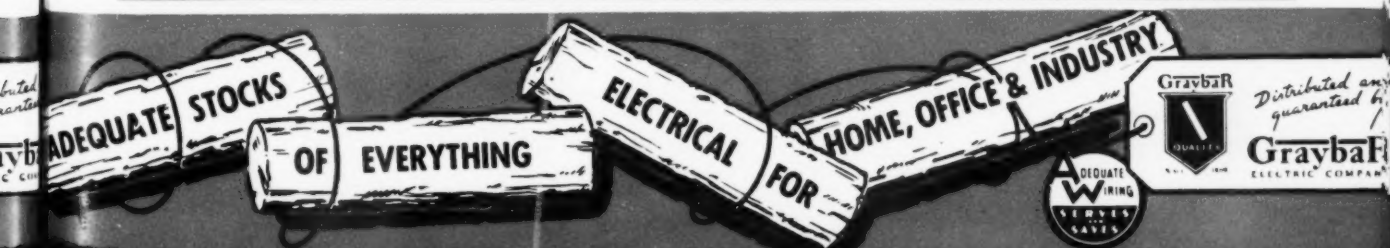
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BUSS Fustats tell users when wiring is inadequate and indicate that they should do something about it right now.

Abolishes useless shutdowns

Starting currents and other harmless overloads don't blow BUSS Fustats. Their long time-lag makes them hang on until such overloads have a chance to clear themselves—yet Fustats will open in plenty of time to protect against any dangerous overcurrent.

You can use a Fustat of correct size to protect a circuit—then load it right up to capacity—and yet not be bothered with needless blows.

There is no more need for time and temper being wasted through having machines and appliances shut down and everything at a standstill just because a protective device blew needlessly. BUSS Fustats offer, at a few cents' cost, safe protection and a cure for such senseless shutdowns.

And with Fustats maintenance costs are cut because regular work is not interrupted by calls to replace needlessly blown fuses.

In spite of long time-lag, protect against hazards of ordinary short circuits.

BUSS Fustats contain a fuse. The ability of a fuse to protect against dangerous cord shorts, grounded sockets,

etc., is well known. The quick action of a Fustat on such ordinary short circuits prevents spraying of molten metal, starting of fires, burning of users.

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It is a fuse to which a thermal cutout is added. . . . It gives all the protection of a fuse. . . . It protects against permanent overloads, even when as light as 25%. . . . Yet it will not blow on motor starting currents. . . . It has a base that guards against anyone robbing the circuit of protection. . . . It fits Edison base fuse-holders through the use of an inexpensive adapter that locks in place.

Opportunity for Contractors—

Sell Hospitals, Schools, Plants, etc., on Reducing Fire Hazards by Replacing Old Fuses

With old style fuses what's to prevent anyone from creating serious fire hazards through over-fuseing or side-tracking of fuses?

Responsible executives are quick to see how BUSS Fustats can reduce the risk of fire or damage from electrical causes.

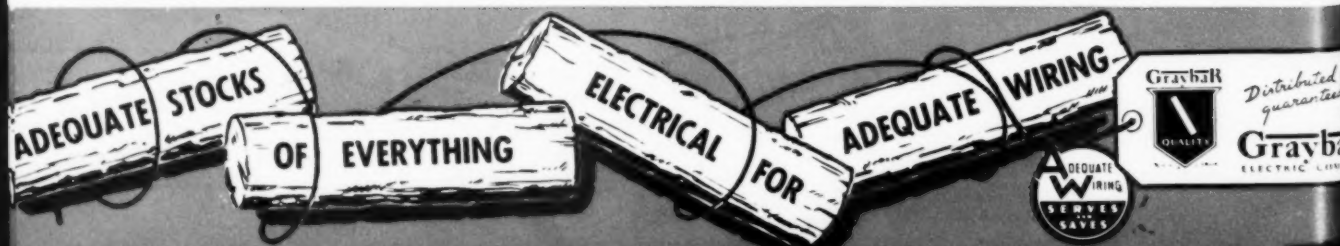
Why not go after this new business? You can find it in:

Hospitals and Asylums	Filling Stations and
Factories and Buildings	Retail Store Chains
Schools and Theatres	Hotels and Apartments

and everywhere that a fire hazard must be avoided.

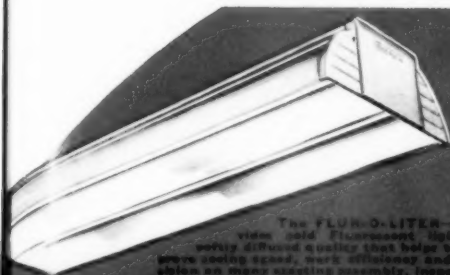
START TODAY TO REPLACE PLUG FUSES—with

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5 Reasons Why It Pays to Specify BENJAMIN Lighting Equipment

New Benjamin developments show how both Contractors and Industrial Plants find their needs best served by Benjamin Lighting Equipment.



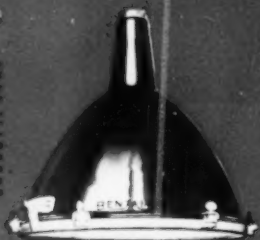
The FLUOR-O-LITE—Provides soft fluorescent light of every desired quality that helps to improve seeing speed, work efficiency and freedom in many working operations. Two highly efficient individual Alzak aluminum reflectors accommodate the new, 44" white or daylight fluorescent lamps. Reflectors are hinged, or housing for easy access to wiring, sockets, etc. Units feature new thermal glow switch starters and new high power factor type starters that minimize flicker.



The STREAM-LITE—A new twin-tube fluorescent unit with a single, efficient, porcelain enamel reflector for the new 40" lamps which, for the first time, make fluorescent lighting practicable for general overhead lighting of industrial interiors. Special deep shaped design of reflector and closed ends of the unit provide adequate shielding. Lamps, sockets, thermal glow switch type starters and high power factor type auxiliaries that minimize flicker are all attached to the reflector which is hinged to housing for easy accessibility.



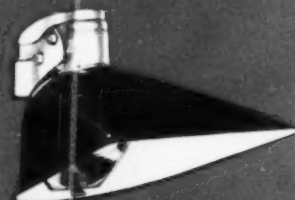
The VAPOR-SEAL—A dome-type unit that is moisture, weather and vapor-proof. Designed to satisfy Underwriters' requirements for installation in Class II, Group G, hazardous locations where combustible, organic dusts and ignitable materials are present. Entire reflector opening is sealed with heat-resisting glass. Valuable in food industries where there is danger of spilling from breakage of unprotected lamps.



New "STEELITE"—A heavy-duty, extremely rugged lighting unit particularly designed for industry's severe service conditions. Unit is completely armor-plated with a steel housing above and "Herculite" heat, acid and impact resistant glass below. Furnished with polished Alzak aluminum reflector for high mounting or etched Alzak aluminum for spread light distribution in medium mounting. Extra servicing and additional safeguard against breakage is provided by the cover frame, which has an exclusive latch feature; it is hinged to the unit and holds place securely when opened.



The STOCK-BIN-LITE—Provides uniform light distribution from top to bottom and from end to end of stock bins, warehouse aisles, tool rooms, shelving, etc. The deep reflector directs ample light even to bins closest to floor. Special reflector directs light above cabinet and end apertures increase illumination between units. Direct glare from the lamp is reduced by shielding reflector.



The FULL-SERVICE FLOODLIGHT—A highly efficient floodlight for protection of grounds, building, yards and docks against sabotage, offering or trespass. Double duty utility is furnished by double reflector construction... one of porcelain enamel for maximum ground coverage... another of Alzak aluminum which can be adjusted to direct a powerful spot of light on desired locations or areas.



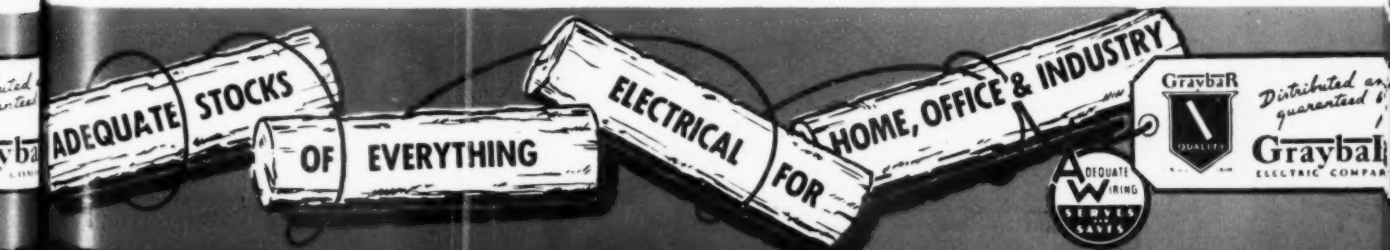
The SILVER BOWL DIFFUSER—Utilizes the unique indirect lighting characteristics of the Silver Bowl lamp in a combined porcelain enamel steel and Alzak aluminum reflector to produce soft, well diffused light with minimum glare or dark shadows. Like many BENJAMIN units, available with patented TURN-LOCK head construction which permits removal of lamp and reflector as a unit for easy cleaning on floor or bench.



HANDY LIGHTING MANUAL—Your copy of the BENJAMIN Lighting Manual that contains complete catalog information on the BENJAMIN line of industrial lighting and floodlighting equipment, as well as a wealth of technical illumination data, intensity tables and installation information will be sent to you on request.

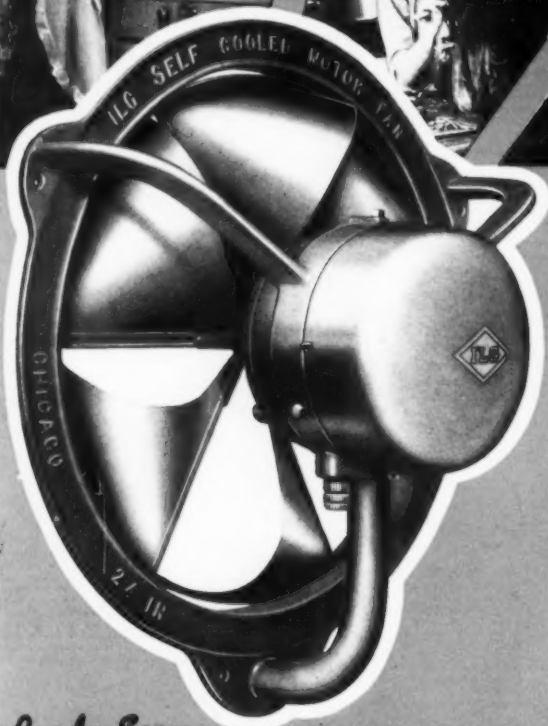
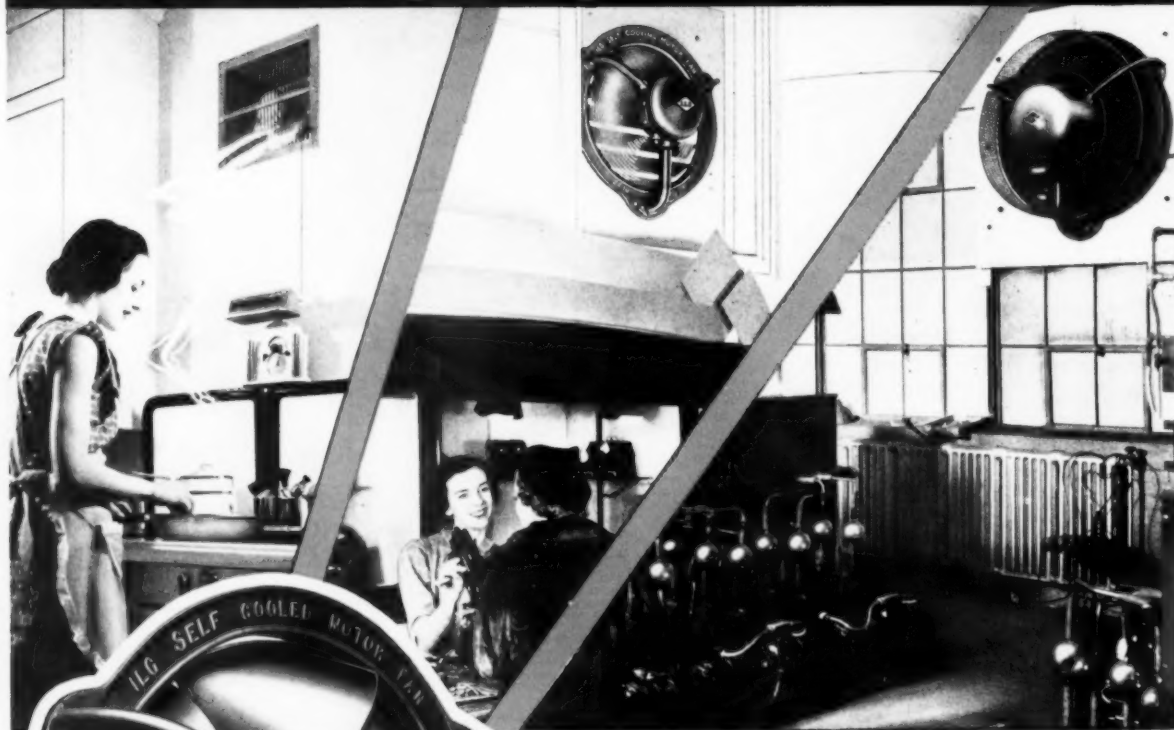
BENJAMIN LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers



THE VENTILATING FAN

...Everybody Knows



It's an Ilg...

the only ventilating fan powered by a self-cooled motor — made, tested, sold and guaranteed as a complete unit — one responsibility. Nationally advertised and distributed, highly recommended by the foremost contractors, dealers, architects and engineers — everybody knows the Ilg ventilating fan. Make sure you have the latest Ilg price and data bulletin. Send for it.

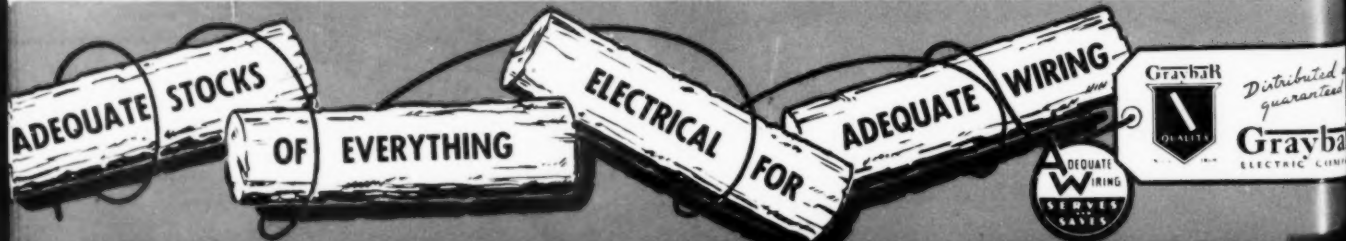
ILG ELECTRIC VENTILATING CO.
2879 N. CRAWFORD AVE., CHICAGO, ILLINOIS
Offices in 43 Principal Cities



Ready Soon...

Attractive Christmas window poster featuring the Ilg Kitchen Ventilator. Sent **FREE** upon request.

VENTILATION
and Air Conditioning



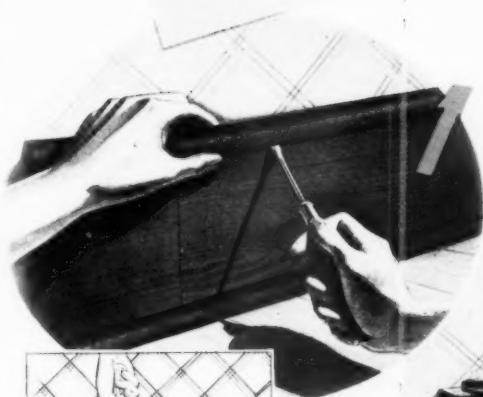
HOUSEHOLDER'S
SALES RESISTANCE
TO DIRT AND MUSS

RUINOUS
PRICE-PER-OUTLET
COMPETITION

DYNAMITE THIS LOG JAM WITH PLUG-IN STRIP

THE NEW WAY TO WIRE • TO REWIRE
(100% ADEQUATE • DIRT FREE • QUICK AND PROFITABLE)

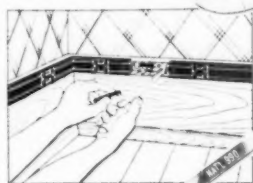
Take off Baseboard Molding Trim



Place "Plug-in" Strip on Baseboard



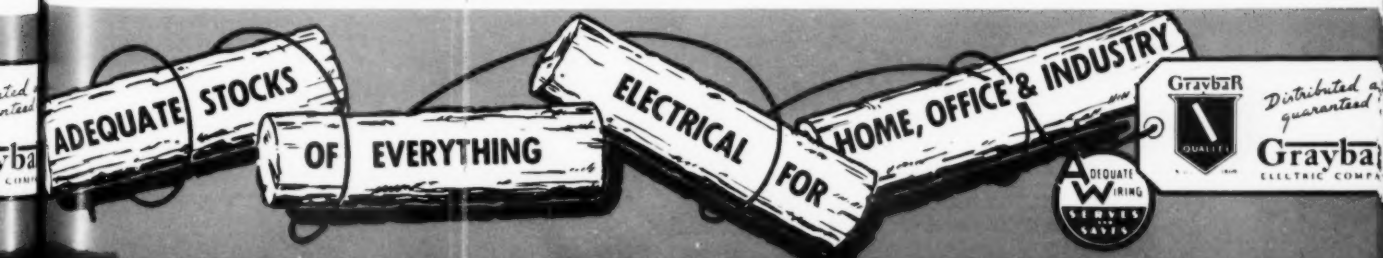
Nail Back Quarter Round
or Molding Trim



To make it still easier...

Mounting clips and copper jumpers are furnished free. The clips firmly hold the strip in place. The jumpers are used to make the connections between the various "Plug-in" Strip lengths.

National Electric Products Corporation • Pittsburgh, Pa.



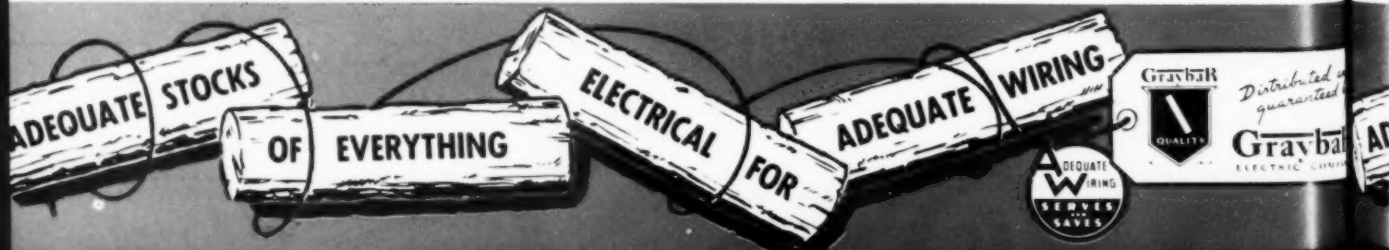
They used STEEL



Three simple compression-type fittings make working with ELEC-TRUNITE Steeltubes a pleasure—during installation and when pulling wires. There are no threads to cut—no long lengths to turn—no pipe wrenches, dies or vises—no damage to the uniform, corrosion-resisting zinc surface. The fittings are water-proof. Grout cannot seep in at joints to cause wiring difficulties. On the Riverview Apartments job, the use of ELEC-TRUNITE Steeltubes permitted the spotting of outlets and immediate mounting of boxes with connectors installed. This enabled the workmen to drop the tubing into place at their convenience.



Look for this label. It is found only on genuine ELEC-TRUNITE Steeltubes.



TELTUBES IN CONCRETE-

now they heartily
endorse it!

After installing more than 72,000 feet of ELECTRUNIT Steeltubes in concrete in the new Riverview Apartments, Detroit, Mich., the Carr-Weller Engineering Company had this to say about this modern electrical raceway:

"Due to the construction of the building, i. e. two-inch concrete floors poured to finish and two-inch partitions throughout, except kitchen and bathroom walls, it would be impossible to use any other type of raceway except ELECTRUNIT Steeltubes—because of the economy of pipe space in a two-inch floor and the fact that Steeltubes could be formed in and around the reinforcing steel in an economical manner.

"Our entire organization from the main office down to the helper on the job heartily endorse Steeltubes for this type of construction. We know this material created an economical result in order to bring the cost within the original appropriation as established particularly by the Government in this instance."

Why not use this same sound method to learn what ELECTRUNIT Steeltubes can do for you? Try it on your next job, exposed or in concrete, and see for yourself why other contractors are using it.

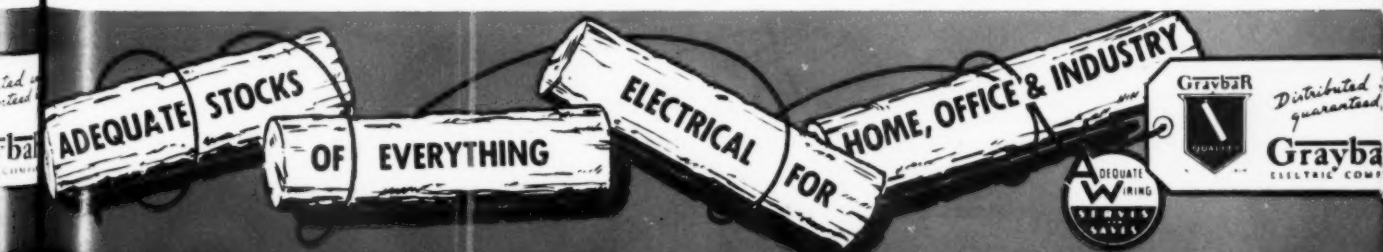


Workmen like ELECTRUNIT Steeltubes because it is so easy to handle—especially in cramped spaces and overhead locations. It bends with remarkable ease and accuracy to any shape needed in concrete construction.



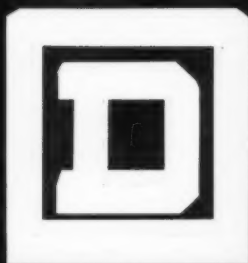
The Riverview Apartments cost \$800,000.00 and provide housing facilities for 178 families. Architects: Derrick & Gamber. General Contractor: The Esslinger-Misch Company. Electrical Contractor: The Carr-Weller Engineering Company. Approximately 72,850 feet of ELECTRUNIT Steeltubes in sizes from 1/2 to 2-inch was used.

Steel and Tubes Division
REPUBLIC STEEL CORPORATION
CLEVELAND . . . OHIO



IN WIRING SPECIFICATIONS FOR EVERY TYPE OF BUILDING

Include



MULTI-BREAKERS

● For small, medium and large homes—commercial buildings—industrial plants—there is a Square D Multi-breaker for every kind of installation.

The Square D Multi-breaker, in its many forms or combinations, provides circuit breaker protection at surprisingly low cost. It can be used as service equipment or for load center distribution. It provides branch circuit switching.

Many architects now specify Square D Multi-breakers. If they are not included in specifications, contractors should show their clients the advantages of this modern convenience. They can sell better installations—at a greater profit.

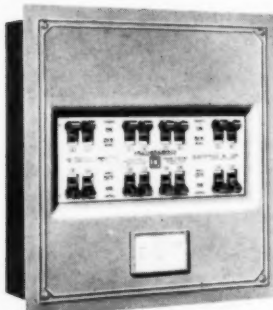
Square D electrical equipment is available through electrical wholesalers everywhere.



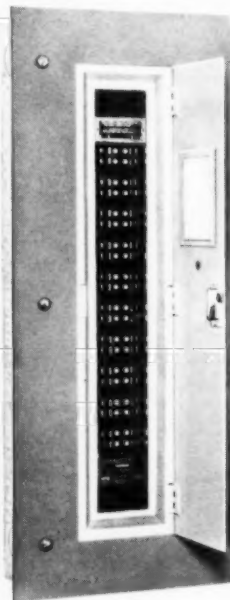
● For the cottage or for addition of water heater. Type MO, one or two circuits.



● For the medium-sized home. Service equipment up to eight circuits.



● Multi-breaker Load Center. Branch circuit protection and switching up to sixteen circuits.



● Multi-breaker Panelboard Narrow-Column Type for industrial installations.

● Multi-breaker Panelboard up to forty circuits.

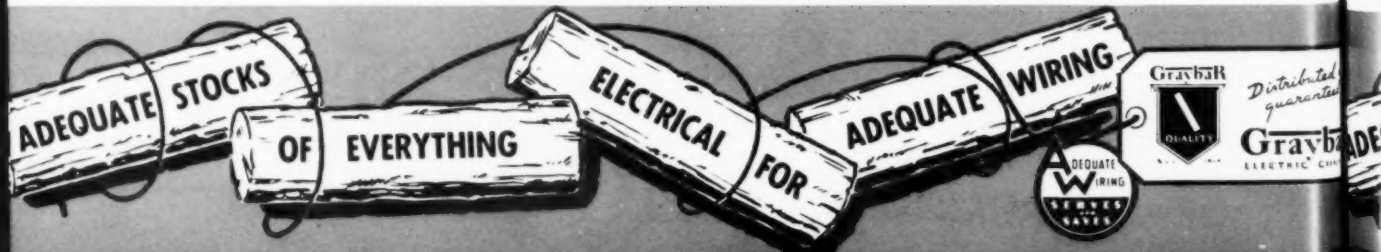
CALL IN A

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SQUARE D MAN



NEW SINGLE GANG WEATHERPROOF COMBINATION WIRING DEVICES

Weatherproof wiring devices have long been available as single units (one-to-a-gang)—NOW here is a line of weatherproof combination wiring devices for single gang installation—Two switches, two outlets or combinations of switch and outlet.

Weatherproof convenience outlets may be switch-controlled—yet the installation need not exceed one gang. Ideally adapted for many industrial and commercial applications—as well as for the home. Send for folder describing the uses of this line.

PASS & SEYMOUR, Inc.
Syracuse, New York.



Weatherproof Switch
Cat. Nos. 4521, 4522,
4523 and 4524.



Two Single Pole Weatherproof
Switches—Cat. No. 4523.



Switch and Outlet
Combination Cat. No. 4526.

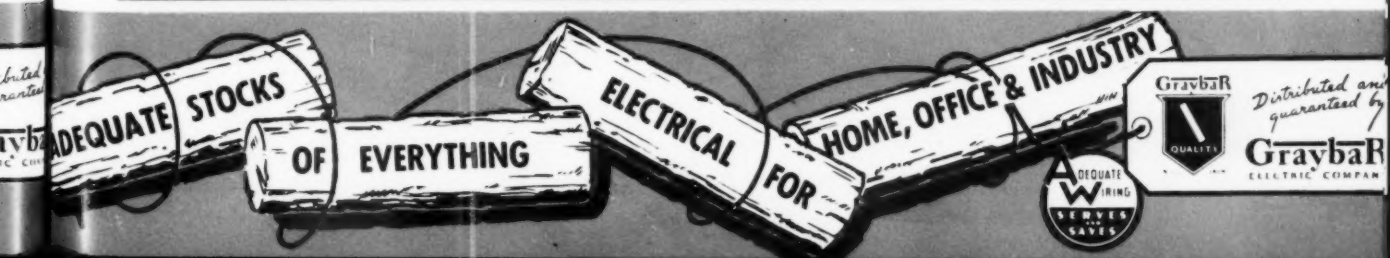


Weatherproof Out-
let—Cat. No. 1533.



Duplex Weatherproof
Outlet Cat. No. 4527.

INDUSTRIAL APPLICATION



JEFFERSON

Listed as standard
by Underwriters'
Laboratories, Inc.

AUXILIARIES AND BALLASTS

For Better Fluorescent Lamp Performance

Small and compact—Jefferson Auxiliaries are on a par in thorough design and construction with Jefferson Transformers used by the hundreds of thousands for luminous tube (Neon) lighting, street lamps, etc.

They are of uniform high quality—made in a specialized plant devoted to this type of manufacture.

Sizes for 15, 20, 30 and 40-watt lamps are now available, with or without thermal switches.

New and Improved Switch

An entirely new switch has been developed which improves starting and re-starting cycles and adds greatly to the dependability of the lamp performance.

Capacitors for Power Factor Improvement

Jefferson Capacitors raise the power factor of fluorescent lamps from the usual 50 to 60 per cent to 80 to 90. Current required is reduced, keeps expense of wiring or re-wiring to a minimum and permits use of more lamps to raise the level of illumination without overloading the circuit . . . The reduced current also improves the voltage conditions, meaning more satisfactory performance.

Jefferson Capacitors are small for easy mounting close to the Auxiliaries . . . They are, like the Auxiliaries, listed as standard by Underwriters' Laboratories, Inc. They are made in three capacities.

JEFFERSON ELECTRIC COMPANY

Bellwood (Suburb of Chicago), Illinois

Canadian Factory: 60-64 Osler Ave. W., Toronto, Ontario

Jefferson
Capacitors
for power
factor improve-
ment. Compact,
and streamlined
for quick and easy
installation.



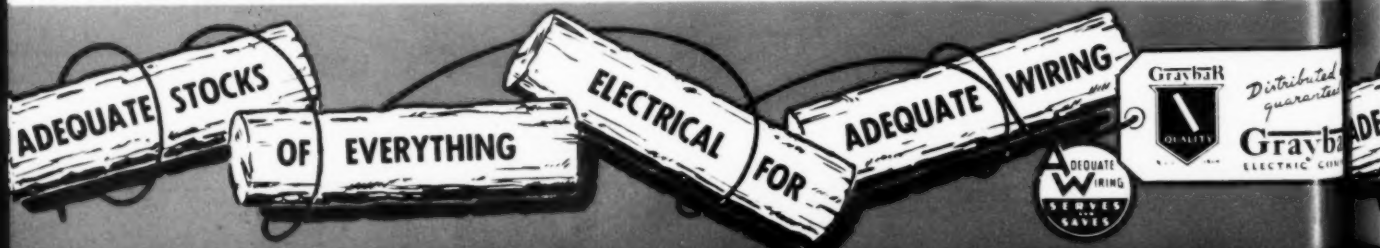
JEFFERSON TRANSFORMERS AND AUTO-TRANSFORMERS

Where 115-volt Auxiliaries are to be used on 230-volt circuits or vice-versa, Jefferson double-wound and auto transformers are available in various capacities for furnishing current of the proper voltage. This circuit

then goes to the Auxiliaries of the fluorescent lamp, and the size of transformer depends on the number and size of the lamps. Complete data is included in Bulletin 393-FL.



**SPECIFY
JEFFERSON
AUXILIARIES
AND
BALLASTS**



THE CURTIS ECONOMY LINE

Expertly Styled . . . Low Priced . . . Easily Sold



THE "RIVAL"

Alzak Reflecting Surface

Although low in price, its high efficiency affords excellent results for use in offices, drafting and school rooms.

NOW
Quantity Production
affords
CURTIS QUALITY
at
LOW PRICES

Manufacturing in large quantities enables Curtis to maintain traditional quality in producing this low priced Economy Line, which supplements the DeLuxe "Eye Comfort" series. • It will pay you to get all the facts from your Graybar salesman regarding these easily sold luminaires.

CURTIS
LIGHTING, INC.



THE "QUOIT"

Alzak Reflecting Surface

A gracefully styled shallow bowl indirect fixture using a regular lamp. Favored for use in offices and school rooms.



THE "DIRECTOR"

Alzak Reflecting Surface

Recommended for drug stores, specialty shops, chain stores and other businesses needing plenty of punch in lighting.

Relighting WITHOUT Refixturing



Store owners can cash in on the improved sales illumination derived from the "Director" if the fitters are the common 6" type. The "Director" bowl with adapter can be installed by merely replacing the old bowl.



THE "DISCUS"

For Silvered Bowl Lamp

A modern styled shallow bowl indirect fixture using the silvered bowl lamp. Desirable for offices and school rooms.

INADEQUATE STOCKS OF EVERYTHING ELECTRICAL FOR HOME, OFFICE & INDUSTRY

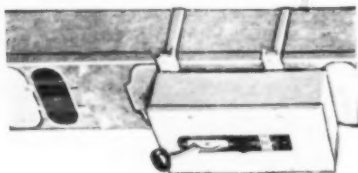
Graybar
QUALITY
Distributed and guaranteed by
Graybar
ELECTRIC COMPANY

W
ADEQUATE
IRING
SERIES
SAVES

FA PLUGIN BUSDUCT



FA Plugin Busduct with Shuttlebrak Switch Plug-in in place



The Modern, Compact, Flexible, Efficient Method for Power Distribution

FA Plugin Busducts consist of standard 10-ft. sections, arranged with nine plugin outlets in cover, on 12" centers. For 2, 3 and 4 wire feeder systems. 250 volts D.C., 575 volts A.C. maximum.

Busducts are made of galvanized steel or aluminum, with proper support for attaching to either walls or ceilings. Flexibility of installation is provided by suitable elbows, tees, end boxes, intermediate feed-in or feed-out boxes—all adapted to fit required space or position. Future extensions may be readily made to existing installations.

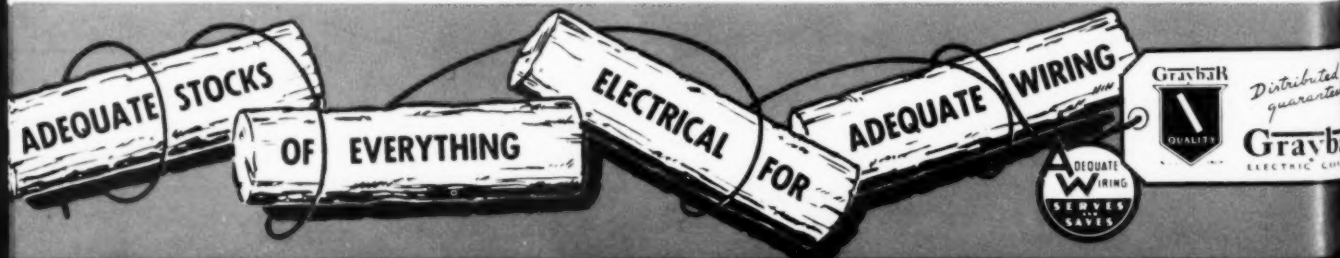
Bus bars are of copper—rigidly supported at 30-in. intervals with insulating blocks that assure proper spacing to meet requirements of the National Electrical Code. Contact surfaces of connecting bars are silver plated to prevent oxidation.

Send for further information—let us show you how you can use FA Plugin Busducts to most effectively arrange your distribution system—economically, easily and according to the latest accepted practice . . . Frank Adam Electric Company, St. Louis, Mo.

FA Shuttlebrak Safety

Type Enclosed Switches

For heavy-duty industrial use — of high grade, rugged construction, embodying a new switching principle — the movement of a shuttle in a totally enclosed chamber. When the current is broken, the final arc is taken by specially constructed arcing tips on the reverse side of the clips from where the current is normally carried.





**GOOD
FISHING!**

★
**Through EVERY FOOT of
Youngstown Buckeye Conduit**

Youngstown Buckeye Conduit has a high speed, high profit raceway. When Buckeye Conduit is bent, the mirror-smooth lacquer lining sticks to the pipe -- flexible yet tough -- no flakes, no wrinkles. Your fish wire can take these corners at high speed and keep right on going -- that's what saves your time and money.

Youngstown, the largest producer of conduit in America, can afford to make Buckeye Conduit as a specialty. Fine equipment and accurate production at Youngstown are justified by this fact -- you get a better product at no increase in cost.

For your next job, buy Buckeye -- and get conduit that works *with* you. Watch your men push that schedule. You'll be through on time, with more money in your pocket.

Conduit - Pipe and Tubular Products - Sheets - Plates -
Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and
Spikes.

26-12B



**THE
YOUNGSTOWN**
SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO

distributed
warranted
ayb
INC. CO.

ADEQUATE STOCKS

OF EVERYTHING

ELECTRICAL

FOR

HOME, OFFICE & INDUSTRY



Distributed and
guaranteed by
Graybar
ELECTRIC COMPANY

DELTABESTON SAVES LOTS OF TIME AND TROUBLE

FOR COILS

Motors, generators, solenoids, lifting magnets—wind them all with *Deltabeston-Heat* resisting *Magnet Wire*. Soft copper conductor and *Felted Asbestos* Insulation increase flexibility—make your jobs go faster. Most important, *Deltabeston Magnet Wire* isn't damaged by high temperatures, moisture and oil. Jobs are more dependable and customers stay satisfied.



FOR SWITCHBOARDS

There's a brand new *Deltabeston Switchboard Wire*—and it's better than ever. Smaller over-all diameter facilitates installations—cuts wiring time. *Flamenol* synthetic insulation improves dielectric strength—isn't damaged by sharp bends, oil or humidity. *Purified, Felted Asbestos* and an impregnated braid help to assure complete protection from heat, flame and abrasion.



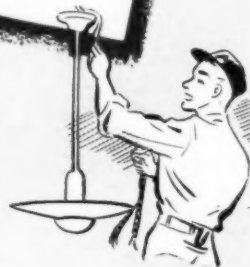
WHEREVER HEAT PREVAILS

Install *Deltabeston Boiler Room Wire* in plants and factories where ambient temperatures are extreme. Your customers will be pleased because *Purified Asbestos* and *Varnished Cambric Insulation* helps to reduce electrical breakdowns—keeps equipment busy. You'll benefit, too, because over-all braid is durable—hard wax finish simplifies conduit installations.



FOR LIGHTING FIXTURES

Heat generated by high intensity lamps ruins ordinary fixture wire. That's one of the reasons you should specify *Deltabeston Fixture Wire*. *Purified, Felted Asbestos* Insulation isn't impaired by high temperatures—moisture—rough treatment. What's more, *Deltabeston Fixture Wire* is flexible—clean stripping—approved by the *Underwriters' Laboratories*.

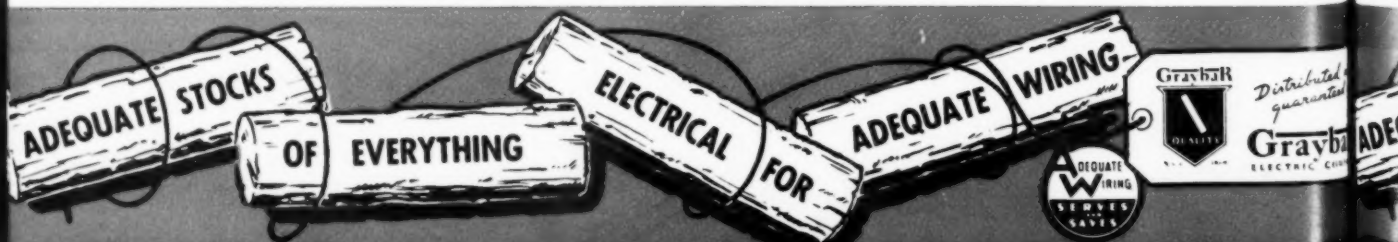


FOR ALL YOUR JOBS

Magnet Wire, Fixture Wire, Motor Lead Cable, Switchboard Wire, Power Cable, Flexible Cords, Boiler Room Wire—there's a *Deltabeston* product to answer every requirement.

For further information and samples, write to Section Y-9411, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut or call your nearest *Graybar Electric Company* Distributor.

GENERAL  ELECTRIC



HOLDING POWER PLUS LONG LIFE!



Engineers and crews LIKE the Everstick Anchor . . . LIKE its ease of installation which means speed and economy in maintenance and construction . . . LIKE its PROVEN HOLDING POWER . . . proven on the toughest jobs. Everstick's record of permanence, strength and safety is your assurance of complete satisfaction.

Malleable Iron with its great tensile strength, high elastic limit, and superior rust resistant qualities is used in the construction of Everstick Anchors.



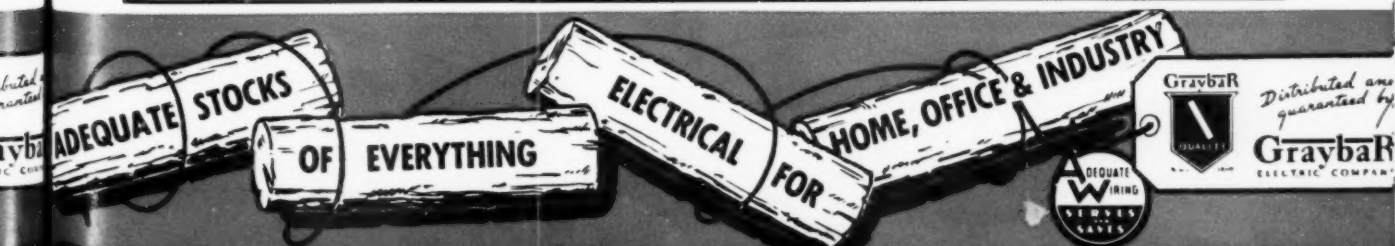
EVERSTICK ANCHORS...



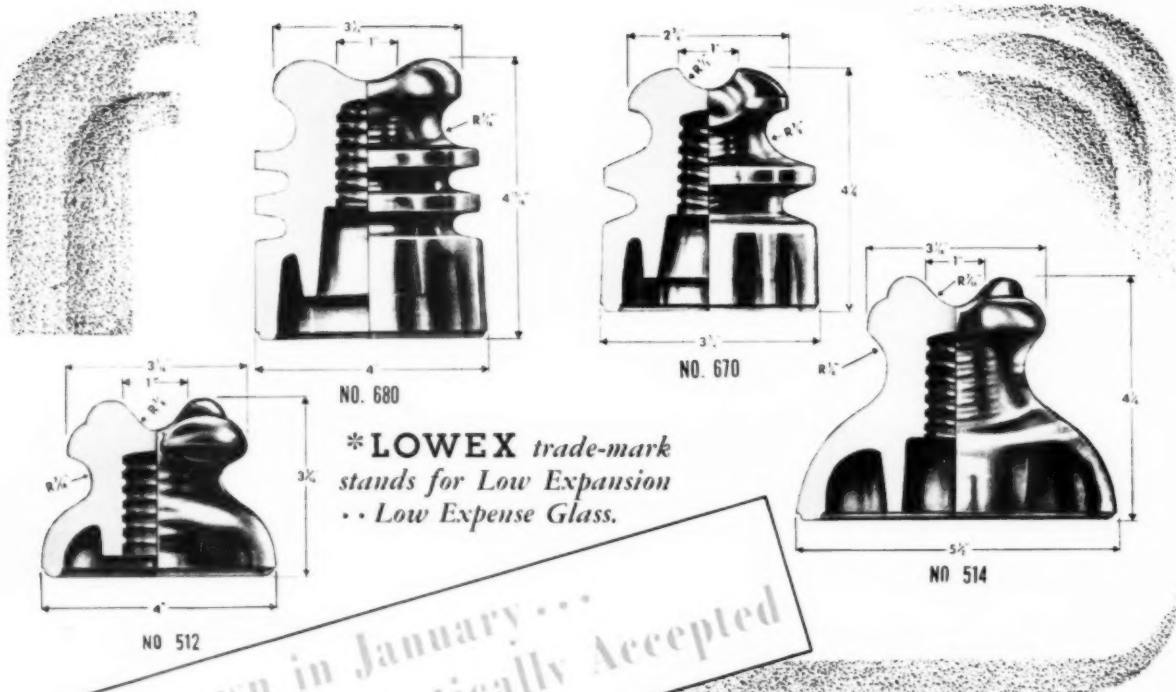
New Nut Housing locks Anchor firmly on rod. Rod cannot slip through Anchor when being installed.

Everstick Anchors are available in 2-way, 3-way, 4-way and cone types in 15 sizes . . . suited to all strain requirements. Used and preferred by leading utilities everywhere.

EVERSTICK ANCHOR COMPANY
FAIRFIELD, IOWA



HEMINGRAY LOWEX*



***LOWEX** trade-mark
stands for *Low Expansion*
• • *Low Expense Glass.*

Today's unqualified acceptance of Lowex by large and small Utility Companies rests upon the support that field performance has given to the exhaustive laboratory tests of Lowex made by Purdue University.

Here are the facts. While low expansion glass in itself is not new, it remained for Lowex to make such glass *economically practicable*. Its low coefficient of expansion is about half that of the glass formerly used. Withstanding *twice* the thermal shock of the old glass, Lowex gives you high resistance against flashover.

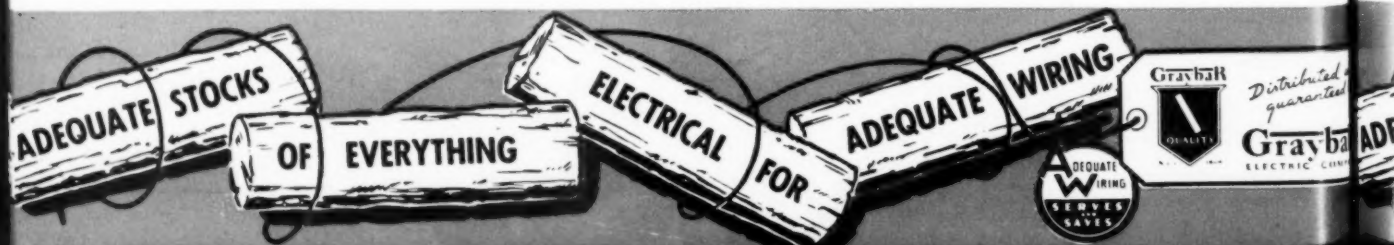
The homogeneity of Lowex obviates punctures.

Having low dielectric constant, it reduces noise level from radio interference and decreases losses in carrying high frequency. The hard surface of Lowex insures added resistance to the actions of the elements and less frequent need of cleaning. Lowex Insulators Nos. 670 and 680 have a long leakage path and smaller diameter than conventional type.

All of which suggests that you, too, can profitably use Lowex for your medium voltage distribution lines. We would be glad to send you all pertinent data. Please write Owens-Illinois Hemingray Division, Muncie, Indiana.

OWENS-ILLINOIS

HEMINGRAY DIVISION • • • MUNCIE, INDIANA



THE ANSWER
for safe, convenient
trouble-shooting"
...say utilities

A MONEY-SAVER FOR
INDUSTRIALS AND
CONTRACTORS, TOO!

**The WESTON AC
Clamp - Ammeter**

Here's an instrument built to utility specifications for *safety, ruggedness, accuracy and versatility*. With 6 current ranges, all changeable while the meter is in circuit, *plus* its many safety features, it provides a broader scope of usefulness for distribution problems overhead and underground.

It's a real *money saver* inside a plant, too. For Clamp-Ammeter circuit testing involves no interruptions to men or machines. The instrument is simply hooked over the conductor, bus bar or switch blade, for current readings. There are no connections to make, and circuits are never interrupted. Thus it simplifies plant maintenance... requires but little time to test and insure the efficient operation of all electrical equipment.

Weston Electrical Instrument Corporation, 672 Frelinghuysen Avenue, Newark, New Jersey.

OUTSTANDING FEATURES

6 current ranges . . . 10/25/50/100/250 and 500 amperes. Higher ranges on special order.

For insulated or non-insulated conductors up to 2" diameter.

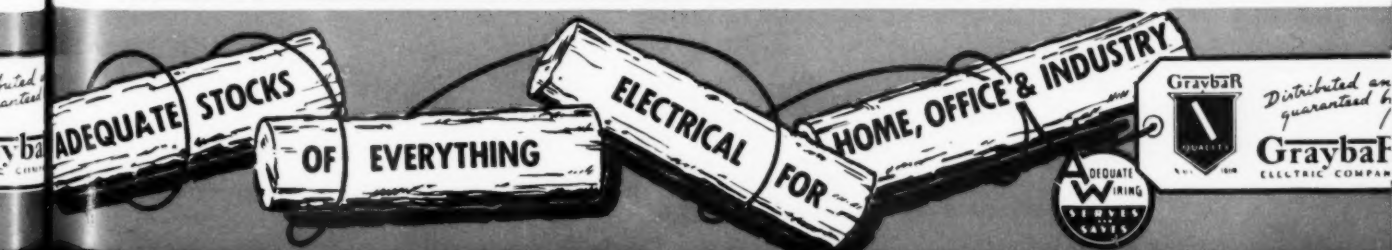
Accuracy guaranteed within 3% between 50 and 70 cycles.

Sturdy bakelite case, handle and trigger . . . for maximum safety.

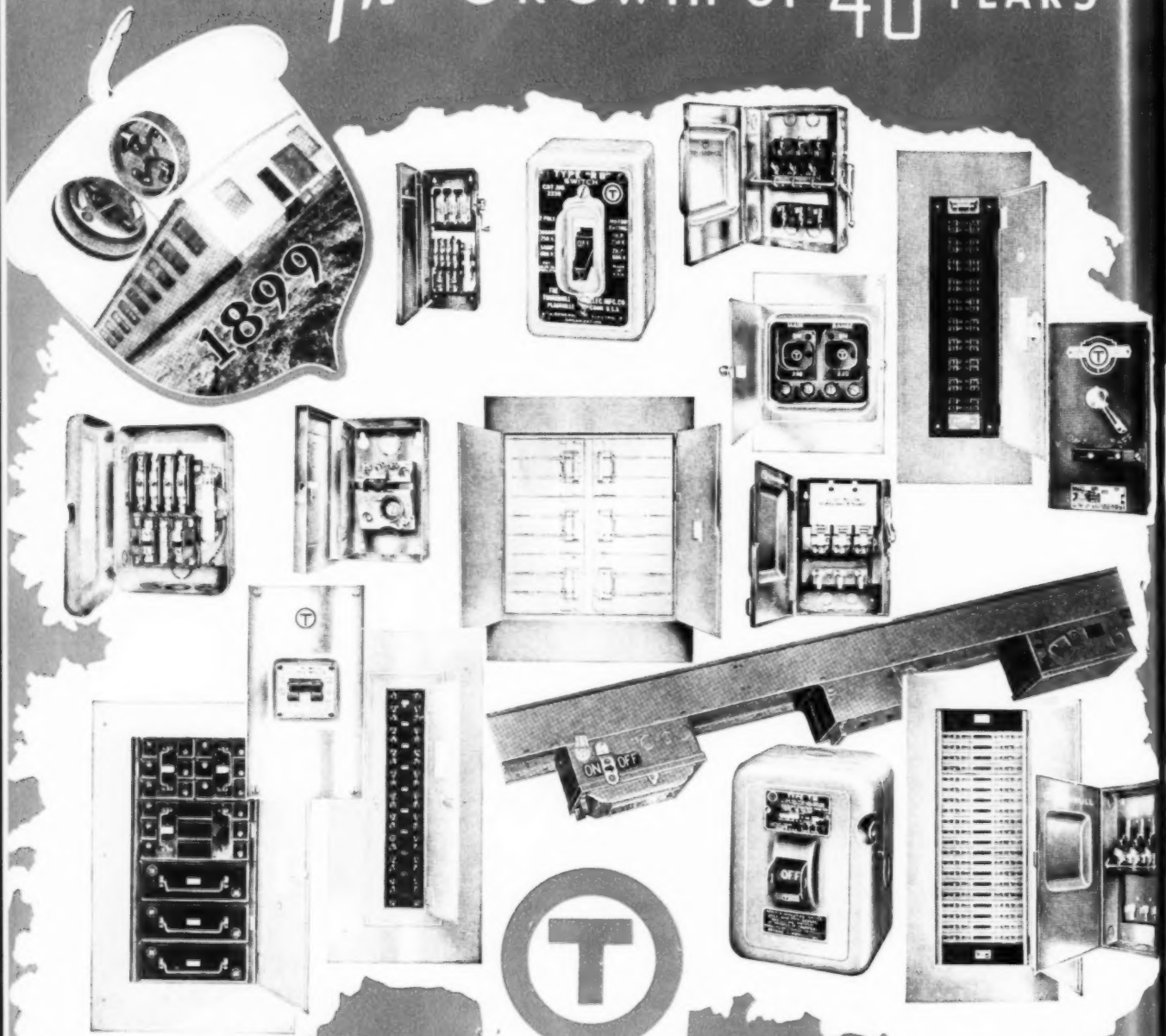
Clamping jaws heavily insulated . . . protects operator . . . prevents short circuits.

Instrument quickly detachable for remote indications.

WESTON *Instruments*



The GROWTH OF 40 YEARS



First, One Product

1939

Now.

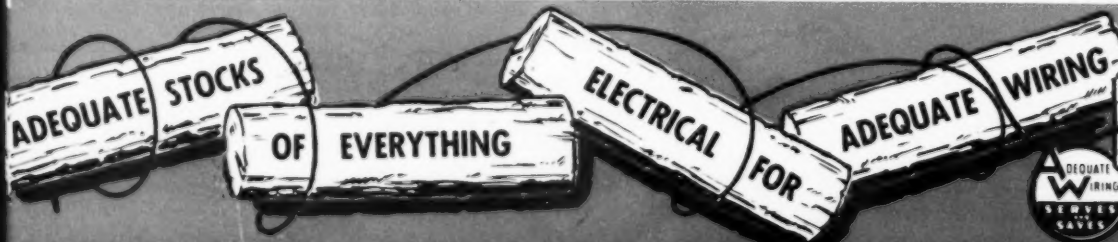
A Complete Line

THE TRUMBULL ELECTRIC MANUFACTURING CO.

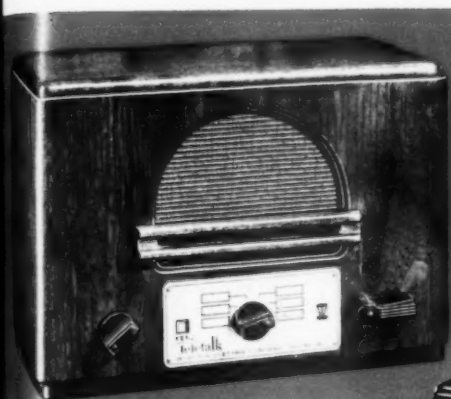
A GENERAL ELECTRIC

ORGANIZATION

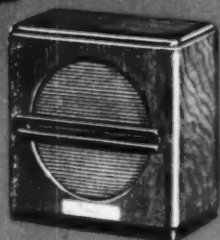
PLAINVILLE, CONN.



We KNOW ^{WEBSTER ELECTRIC} Teletalk is Easy to Sell!

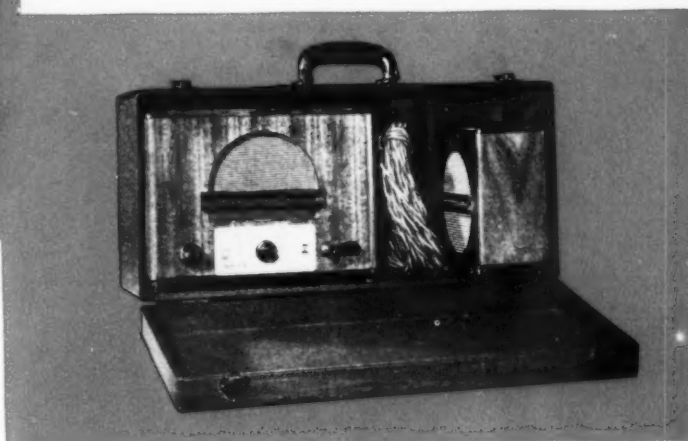


Prove it to Yourself by Ordering this Special Demonstration Kit at 26% less than the Dealer Net Cost for the Teletalk Units Alone . . . The Case and Wire are FREE!



TELETALK is easy to sell! . . . This New Demonstration Kit will prove it and make it easier than ever! It permits you to show your prospect—*right in his own place of business*—how invaluable Teletalk can be to him.

The Kit contains one Model 105 Teletalk and one 5A-45 Speaker-Microphone, with 50 feet of connecting wire and connectors—all enclosed in an attractive, light weight case. The units and case are easy to carry and are easily removed for demonstration. You just place the two units where your prospect can use them to best advantage, connect them quickly, and let him use them in his own way. Leave the installation as long as you think necessary. Give your prospect a chance to prove Teletalk convenience to his own satisfaction. This Kit will do an excellent selling job for you in one day's time.



WHEN YOU DEMONSTRATE YOU SELL!

Send for this folder which tells you all about this Special Deal!



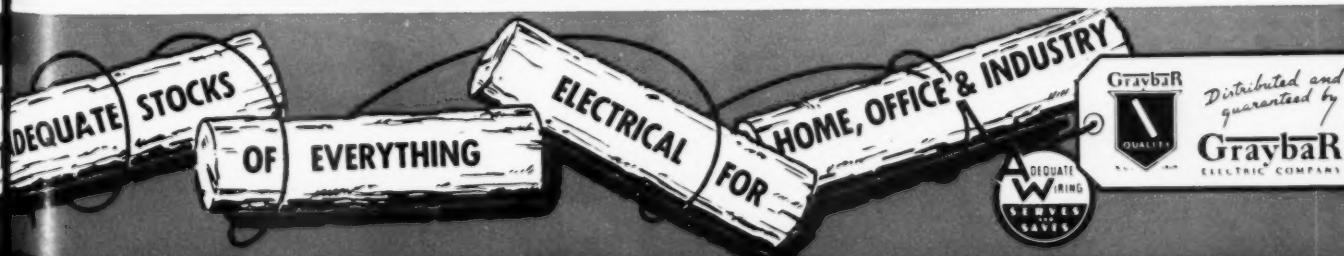
Investigate this special offer, at once. Send for the folder describing it, and learn how you can take advantage of this easy, quick way to demonstrate Teletalk!

Licensed by Electrical Research Products, Inc., under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated

WEBSTER ELECTRIC COMPANY • Racine, Wisconsin, U. S. A.
Established 1909. Export Dept.: 100 Varick Street, New York City. Cable Address: "ARLAB" New York

Webster Electric

"Where Quality is a Responsibility and Fair Dealing an Obligation"





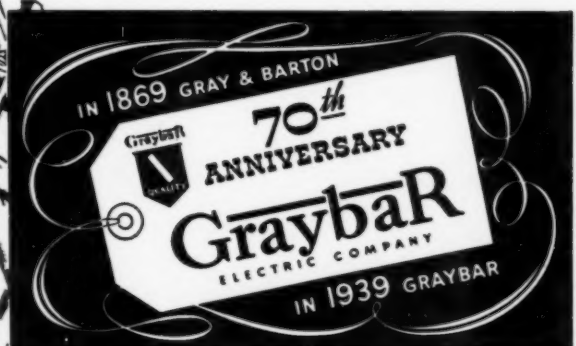
Frank Adam Electric Co.
 Benjamin Electric Mfg. Co.
 Bryant Electric Co.
 Bussmann Manufacturing
 Company
 Curtis Lighting, Inc.
 Everstick Anchor Co.
 Fibre Conduit Co.
 Harvey Hubbell, Inc.
 Ilg Electric Ventilating Co.
 Jefferson Electric Co.
 National Electric Products
 Corporation
 Owens-Illinois Glass Co.
 Pass & Seymour, Inc.
 H. B. Sherman Mfg. Co.
 Silvray Lighting, Inc.
 Square D Co.
 Steel & Tubes, Inc.
 The Thomas & Betts Co.
 The Trumbull Electric Mfg.
 Company
 Webster Electric Co.
 Weston Electrical
 Instrument Corp.
 York Insulated Wire Works
 of General Electric Co.
 Youngstown Sheet & Tube
 Company

THE PRODUCTS OF THESE KEY SUPPLIERS CAN HELP YOU MOVE THAT KEY LOG!

The Graybar suppliers listed on this page are recognized throughout the entire electrical industry as outstanding in their own product group. You can depend on these companies ... and on the products they make ... for your Adequate Wiring and other electrical needs.

Furthermore, when you deal with Graybar, you get not only reliable products, but you get, also, Graybar's prompt "action service" to bring you what you want, when and where you want it.

You get the benefit of a nearby, well-stocked Graybar warehouse, well-manned by Graybar men experienced for years in serving contractors' needs. And you get a solid Graybar guarantee backing every sale.



Estimating

TWISTED PAIR IN CONDUIT

There is no Code limitation on the number of twisted pair telephone wires that may be pulled into a conduit for intercommunication service. But good engineering practice demands that the conduit area allow ample room for easy pulling of these relatively delicate conductors.

The following table gives a practical minimum size of conduit for standard No. 19 twisted pair telephone wires, where there are not more than two 90 deg. bends. For more bends and for long runs it may be advisable to use the next size larger conduit.

Conduit Size for No. 19 Twisted Pair Telephone Wire—

$\frac{1}{2}$ in. conduit—	1 to 3 pairs
$\frac{3}{4}$ in. conduit—	4 to 6 pairs
1 in. conduit—	7 to 10 pairs
$1\frac{1}{4}$ in. conduit—	11 to 16 pairs
$1\frac{1}{2}$ in. conduit—	17 to 25 pairs
2 in. conduit—	26 to 35 pairs

FARM WIRING LABOR UNITS

Differences in experience and ability among rural wiremen makes the compilation of man-hour units on rural wiring difficult. Data is less accurate than those applicable to commercial and industrial electrical work, yet sufficient rural wiring experience is now available as a basis for approximate labor standards.

The data in the following tables is compiled from several sources in the Middle West. They are based on the work of rural wiremen of average skill and experience.

The tabulation follows the practice, now standard, of estimating the labor on the basis of unit operations. Combined with the material cost, expense, and mark-up, the total provides the unit prices used in estimating farm wiring work.

These labor units are based upon the use of non-metallic sheath cable in interior wiring, service entrance cable for entrances, and weather-proof wire

WHAT IS YOUR EXPERIENCE?

The following tables of labor units for farm wiring present the first published analysis of work in this field in so far as we know. It is based upon actual experience data.

Electrical Contracting will be glad to hear your comments. Is this material sufficiently complete? Is it sufficiently detailed? How does it compare with your experience?

for lines between buildings. The labor units for interior wiring are based upon a farm house of normal construction, where it is possible to conceal the wiring without excessive amount of channeling or replastering.

In this analysis a distinction is drawn between the first floor outlets and the second floor outlets, based upon easy access from the attic floor. The cost of installation may be averaged and a single unit established for all such outlets. If the number of outlets on the first floor is approximately the same as the second, in the ordinary run of jobs, an average unit would be satisfactory.

The unit labor cost shown cannot be applied to resort cabins, lake cottages, or small homes involving very few out-



COORDINATOR, J. C. Snyder, active secretary of the Louisville Builders Exchange, has several building organizations, including the Louisville Electrical Contractors Association, working together for industry advancements.

lets. The layout, lost time and clean-up which must be absorbed in the unit cost is relatively much higher on such small homes with few openings.

SERVICE

METER LOOPS (in conduit)

Not including disconnect switch

	Man-hours each
5 wire No. 6 bare neutral.....	4.00
5 wire No. 4 bare neutral.....	5.00
5 wire No. 2 bare neutral.....	6.25
60 amp. disconnect switch.....	2.20

GROUNDING

Bare No. 6 and rod.....	.80
-------------------------	-----

SERVICE ENTRANCES

2 wire No. 8 with 15 ft. cable....	1.75
3 wire No. 8 with 15 ft. cable....	2.00
3 wire No. 6 with 15 ft. cable....	2.00
3 wire No. 4 with 15 ft. cable....	2.50
3 wire No. 2 with 15 ft. cable....	2.50
Each additional foot of cable....	.05

OUT BUILDING SERVICES

2 wire No. 10 with 15 ft. cable...	1.30
3 wire No. 10 with 15 ft. cable...	1.50

GROUNDING

No. 6 bare wire and rod.....	.80
------------------------------	-----

HOUSE

DISTRIBUTION PANELS

(Pullout main, plug fuses in branches, surface mounted)	
30 amp. 2 wire main, 2 branch...	1.00
30 amp. 3 wire main, 4 branch...	1.50
60 amp. 3 wire main, 4 branch...	1.70
60 amp. 3 wire main, 6 branch...	2.20
60 amp. 3 wire main, 60 amp. branch, 4—30 amp. branch...	2.90
Each additional 15 amp. 2 wire circuit25
(Same units apply to circuit breaker panels)	

FARM HOUSE WIRING

(Non-metallic sheath cable)	
Ceiling light outlet—(first floor)..	1.25
Ceiling light outlet—(2nd floor)..	1.00
Side bracket outlet.....	1.10
Switch outlet SP switch and plate.	1.30
Switch outlet, 3 way switch and plate	1.45
Duplex receptacle and plate.....	1.30
Pilot light	1.30
Full circuit receptacle outlet....	1.65
Electric Range outlet with 20 ft. cable	2.25
Each foot additional cable....	.03
Transformer, bell and push button	2.35
Lighting fixture80
Bracket fixture50

OUTBUILDINGS

OUTBUILDING WIRING

(Non-metallic sheath cable, surface outlets)	
Light outlets (with receptacle cover)	1.20
S.P. switch outlet.....	1.10

Look for Quality IN CONDUIT



G-E WHITE GIVES LASTING PROTECTION

There is always a good market for first quality conduit. It will be to your advantage to investigate G-E White Rigid Conduit. This conduit is hot-dipped galvanized and Glyptal-coated inside and out. It is resistant to heat, flame, gas, acids, alkalis and moisture. It is easy to bend and install. A complete line of boxes and fittings is available.

OTHER G-E RACEWAYS AND CABLES

Quality can very well be considered first today in selecting other conduit products, too. G-E materials, of course, rank high in quality. And the line is complete including G-E Flexible Metal Conduit, G-E Electrical Metallic Tubing, G-E Fiberduct Underfloor Raceways, G-E Service Entrance Cable, G-E "BX" Armored Cable, G-E BraidX Non-metallic Sheathed Cable.

For further information about G-E White Conduit or other G-E Conduit Products see the nearest G-E Merchandise Distributor or write to Section C-9411, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.



GENERAL ELECTRIC

Estimating

[FROM PAGE 61]

3 W switch outlet.....	1.25
Plug receptacle outlet.....	1.10
Hay mow light outlet.....	2.50
Yard light and S.P. switch.....	3.25
Yard light and 2—3 way switches.....	5.35
Water pump.....	2.00
Motor and motor switch 1-3 hp.....	2.00
Motor and motor switch 5 hp.....	2.25

OUTSIDE WEATHERPROOF WIRE

12 to 8 per foot (average 75 ft. or more).....	.01
8 to 4 per foot (average 75 ft. or more).....	.012
For spans 50 to 75 ft. add 50 per cent.	
For spans 25 to 50 ft. add 100 per cent.	

FIGURING JOB EXPENSE

Job expense, although it includes sizable items, usually gets less detailed analysis by the estimator than small items of material amounting to much less cost.

Many job expense items may be calculated exactly. Others require an approximation to "cover" a service of unknown cost. The percentage of error in job expense figures can be materially reduced by accurately figuring all of the known items and limiting the guess work to the unknowns.

In general, job expense consists of the cost of services required by the job which are not included in the material or the wages paid, such as

1. Social Security Tax
2. License Fees
3. Workmen's Compensation
4. Public Liability
5. Bond
6. Inspection
7. Freight, Express and Cartage
8. Traveling Expense
9. Board and Lodging
10. Rented Tools
11. Drafting Expense
12. Engineering Service

Taxes, compensation, and liability may be calculated to the penny, on the basis of the labor total. Many estimators use a factor, including all three items applied to the labor figure, approximating 7½ per cent.

Bond, license fee, and inspection fee may also be calculated exactly from the estimate—the bond as a percentage of the job total, license as a fixed fee, and inspection on the basis of number of outlets or circuits.

If handled separately, the balance of the items can be approximated very

closely. The known freight charges on larger items are usually included in the material summary. In the job expense column, this item usually includes only the minor charges on small shipments. Cartage would include items not carried on the contractor's own equipment. A figure of two per cent of the total material cost will usually provide a safe approximation for these items.

Traveling expense and board and lodging may be calculated fairly closely from the total labor hours. Board and lodging should be figured on a weekly basis. Divide the number of labor hours by the number of working hours per week, and multiply by the board and lodging rate per week.

Total labor hours x weekly rate
Hours per week per man = total cost

A very common estimating error is to forget that while men work five days a week they eat seven.

Items of drafting expense and engineering service should include only such work as is directly chargeable to the job. For instance, if the contractor makes lay-out drawings for every job, that is a part of his overhead structure. However, if specifications require the contractor to submit special layouts or diagrams which he must prepare at additional expense, that belongs in the job expense column. The same distinction is true of engineering services. Under this heading the job expense column should include outside engineering consultation, engineering reports, or testing laboratory services.

The job expense column should be figured as accurately and carefully as any other part of the estimate, and not used as a dumping ground for miscellaneous items. Some guess work is always involved but the probable error can be effectively reduced by weeding out and carefully figuring all of the items that can be accurately estimated in advance.

TYPICAL JOB EXPENSE ANALYSIS

Total material.....	\$2255.00
Total labor hours—1750 at \$1.09..	1907.50
Total job expense.....	921.00
	\$5083.50

Detail of expenses

Tax and insurance 7.6%...	\$145.00
License fee.....	5.00
Inspection.....	26.00
Bond.....	62.00
Freight, expense, cartage..	45.00
Traveling expense—17 trips at \$4.00.....	68.00
Board and lodging at \$12.00 wk.....	525.00
Drafting expense.....	45.00
Engineering.....	
Rented Tools.....	
	\$921.00

An Authority Speaks!

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WOOD'S CATALOG No. 82
ready for distribution.

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WOOD'S
CATALOG
No. 82

is packed with
facts concerning
modern POWER
TRANSMISSION
MACHINERY.

It is a comprehen-
sive TEXT BOOK
—dealing with effi-
cient power trans-
mission equipment
and methods.

Engineers and users
of machinery should
have a copy in their
files for ready refer-
ence wherever power
is mechanically trans-
mitted.

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DEALERS

The Wood's Sales Fran-
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desirable territories are
still available. Get your
copy of catalog and details
of our sales plan.

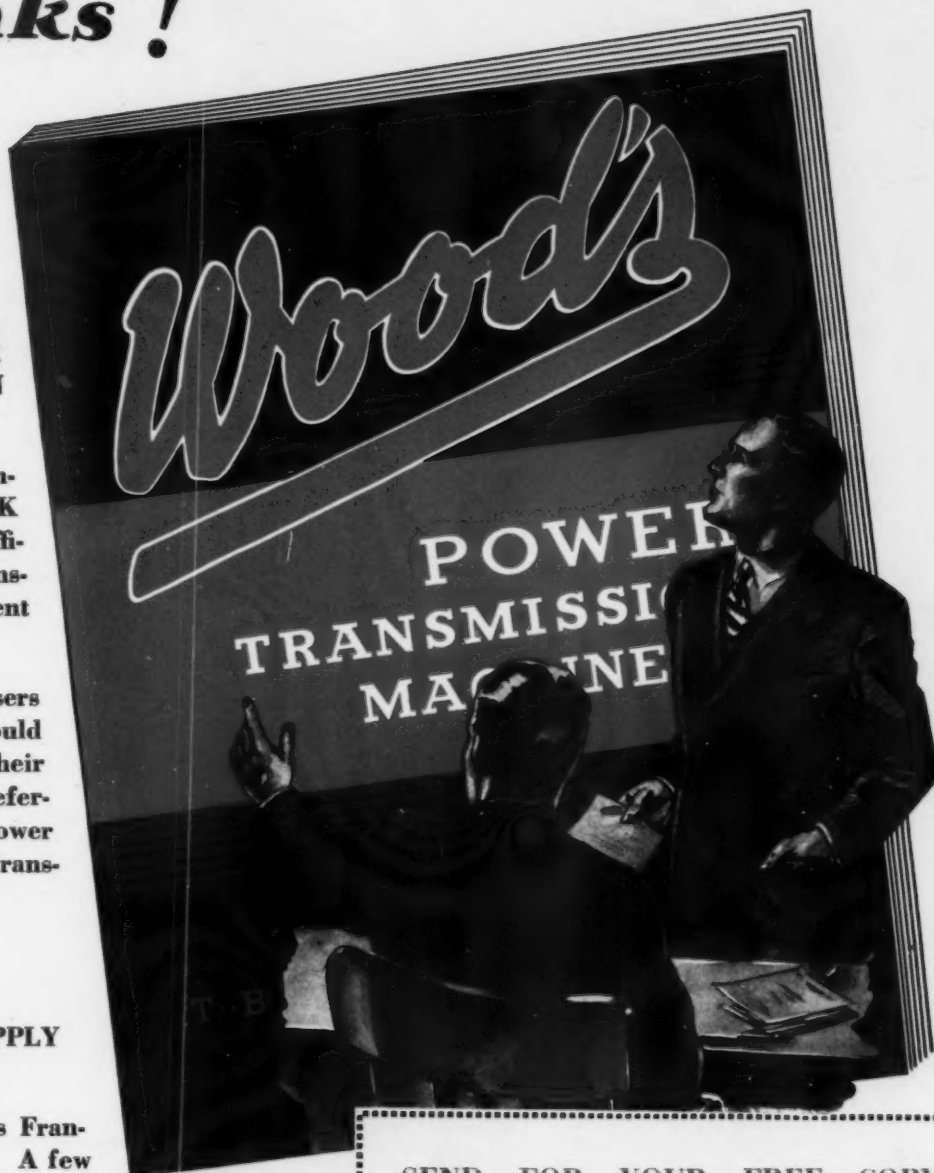


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Chambersburg, Pennsylvania

BUILDERS OF THE BEST IN POWER TRANSMISSION MACHINERY



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TITLE

COMPANY

ADDRESS E C-11

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Electrical Contracting, November 1939

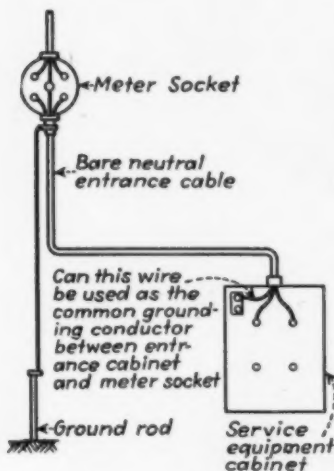
Questions ON THE Code

Answered by
F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Service Grounding

Q. "On an outdoor meter installation on a rural house where no water pipe is available, a ground rod is required for grounding the service entrance panel enclosure and the service neutral. Is it permissible to ground the meter socket direct to the ground rod, using the neutral wire to ground the service entrance enclosure?" — C.H.K.



A. The set-up explained and shown as above is not specifically and clearly covered in the Code. There is nothing to definitely rule out such an arrangement, nor is such a system of grounding mentioned.

However, there seems to be no objection which can be raised, provided the grounding clamp is of such a type as to make a good solid electrical connection with the bare neutral (and its armor, if any) and, of course, provided the fibrous outer covering of the neutral conductor is skinned back. It would also be necessary to bond the

cable armor to the service entrance cabinet, as required by paragraph 2552 (not shown in sketch).

Power and Light in Same Conduit

Q. "We have two transformers hung outside a certain building, which connect to a three phase 2300 volt power line. These transformers are connected together Delta to supply three phase, 220 volt service with the neutral of one transformer tapped to provide four wire power and lighting service. This enters the building through one conduit terminating in a combination lighting and power panel box of the latest approved type.

"Is it permissible to run in the same conduit 3 phase 220 volt service and three wire lighting service from the panel box, a distance of 50 ft. to another portion of the building to another combined light and power panel box? Keep in mind that the conduit is of the proper size and the two services are originally off the same bank of transformers; also that these wires, with the exception of the neutral, are all fused on both ends of the conduit in the panel boxes." — C.E.G.



THESE INSPECTORS, T. A. Thompson of Hutchinson and C. W. Turner, field engineer of the Minnesota State Board, tried the wicker rockers at the Alexandria convention.

A. Section 3013 says that conductors of different systems shall not occupy the same raceway, enclosures, etc., except under specially stated conditions; but the rule refers us to the Code definition of different systems. In Article 100 we find that "different systems" are those which get their supply from transformers connected to separate primary circuits or transformers having different maximum voltages.

In the above question, the transformers are connected to the same primary supply and have the same maximum voltages, therefore it is not a Code violation to run the wires for the lighting feed and for the power feed in the same conduit.

Bridge Cable Protection

Q. "I have been reading your answers to questions on the 'Code' as they appear monthly in 'Electrical Contracting,' and am prompted to write you concerning a problem recently encountered on one of the Ohio River toll bridges owned by Kentucky. My assignment with the Kentucky Highway Department has mainly to do with bridge maintenance.

"The navigation and roadway light circuits were placed in rigid conduit, which had been laid on top of the lower longitudinal member of the bridge railing. Here the conduit was properly level for several thousand feet and fully exposed to rays from the sun throughout the afternoon. The cable was all single conductor insulated with 30 per cent rubber compound and braided.

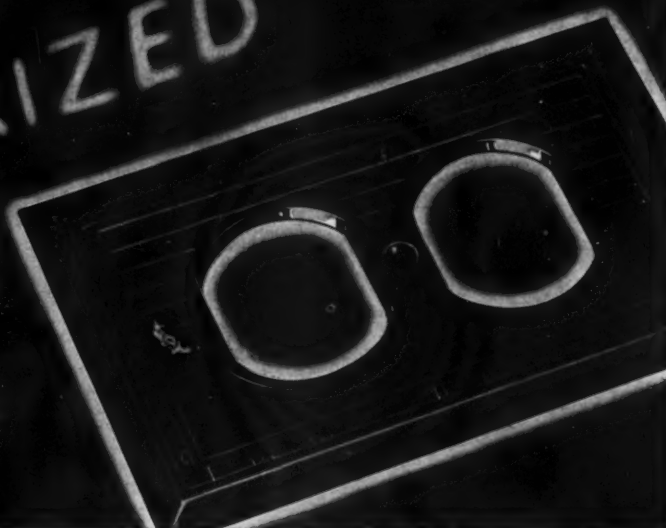
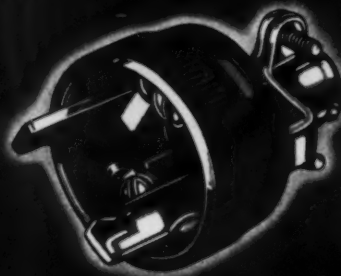
"After about four years service, grounds and shorts developed and sections of cable had to be replaced. This condition continued to grow worse until complete rewiring became necessary. Some tampering with conduit covers was experienced, so there were times when moisture could enter through as many as one 2 in. Mogul conduit facing up and without cover, and two similar conduits with covers but without gaskets. These openings were distributed at intervals along 1500 feet of perfectly level conduit.

"My question is, what was mainly responsible for the rapid deterioration of insulation? Was it condensation or precipitation through conduits found open at various times or high afternoon temperature reaching a probable maximum of 115° on warmest days?

"In future installations an insulation more resistant to moisture and heat can be used and provision made to keep the conduit tight. Will there then be enough condensation to necessitate pitching the conduit down to the junc-

H & H

20-AMPERE
2-WIRE DUPLEX RECEPTACLE
-POLARIZED



FOR HEAVY-DUTY appliances—motor and heating loads requiring *polarized circuits*—this Receptacle has been newly developed in the DUPLEX Type. Rated 20 Amperes, 250 Volts, with 2-wire Polarized Plug.

Receptacle has an all-Bakelite body, 1" deep; fits standard shallow wall box and takes standard duplex plate. Side-wired for easy access, with four big binding screws for heavy wire. Plaster ears standard.

Plugs are all-Bakelite — 2-wire polarized — with metal Cord Grip. Plates are ordinarily of Bakelite, in the standard UNILINE design . . . Provide these ADEQUATE outlets for heavy-duty appliances by ordering the following Catalog numbers:

7858 Receptacle, 20 Ampere Duplex, polarized, in brown Bakelite. 7859 Cap for same, in brown Bakelite. (Standard package, 30; carton, 10) . . . 91101 Plate, brown Bakelite in UNILINE Design.

SOLD THROUGH YOUR

HART & HEGEMAN DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

ELECTRICAL WHOLESALER

Electrical Contracting, November 1939

65

SHAWMUT



SHAWMUT

is the word for fuses

SHAWMUT

has been the word for fuses for nearly half a century

SHAWMUT

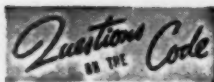
means a fuse for today made by a firm which has specialized in fuses

**SINCE
1893**

The Chase-Shawmut Company



Newburyport, Massachusetts



[FROM PAGE 44]

tion boxes which would have drain holes drilled through their bottoms?

I realize that this is not a Code question and do not wish to impose, but an expression of your opinion would be greatly appreciated."—J.T.M.

A. The above letter is extremely interesting. It relates an occurrence which has been many times repeated on similar installations.

The conditions which have combined to produce the results complained of by our correspondent are:

1. Excessive temperatures from the sun.
2. Moisture from the weather, both from rain beating into open condulets and from being breathed into the system.
3. Cooling rains and fog, also probably dew.
4. Vibration.

Because of the presence of moisture, which is unavoidable, rubber covered wire should be used. And it will probably be advisable to use either lead covered or the new low absorption wire. But the temperatures encountered are too high for the regular Type "R" wire and it would be better to use some of the new high heat rubber covered wire. If possible, the conduit should also be kept out of the sun.

The conduit should be run *underneath* rather than *on top* of the bridge railing. Some railroad systems cover their conduits along the tracks with strips of cheese cloth. To avoid excessive moisture troubles, lead covered wire should be used (as required by Code rule 3035) and the conduit system should be made watertight (as required by rule 3465) and also be arranged to drain.

With these precautions the installation would probably give satisfactory operation for many years were it not for the vibration of the bridge. The vibration probably causes the wires to work their way through the dried out rubber insulation and thus cause grounds and short circuits. Probably here is a need for the new type of synthetic insulation which is recognized by the Code only under special permission as set forth in Section 3004h.

Circuit Loading

Q. "I have been wiring houses according to my interpretations of the Code and have been getting by. Recently I looked at another man's job

and find he has 41 lighting and appliance outlets including 1-1/6 hp., 110 volt motor (this is not including switches) all on three 15 amp. branch circuits. I would like to know if this is according to the Code for I have been figuring 1 1/2 amp. per outlet for lights and plug receptacles and the nameplate rating of appliances. The way I have been wiring, I would have used five branch circuits which is some difference in cost."—R.I.C.

A. Of course, a job with five branch circuits provides greater adequacy than one with only three and is therefore worth more to an owner than a more skimpy job. If the owner is given his choice he will probably gladly pay the small additional cost to get greater adequacy.

However, if the building in question is one of about 1500 square feet of floor area, the number of circuits can be computed in accordance with section 2107 as follows:—

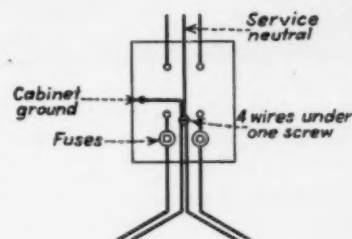
Lighting load	1500 x 2
(watts per sq.ft.)	= 3000 watts
Appliance load	1500 "
Power load (1/6)	375 "
	<hr/>
	4875 watts

4875 ÷ 120 = 40 plus amps. which requires three 15 amp. branch circuits.

The Code would thus permit the 41 or more outlets to be installed on the three branch circuits, provided that the floor area of the house is not greater than the 1500 square feet.

Several Wires Under One Terminal

Q. "We have noticed some service boxes having one screw for neutral connection. Contractors are using this one screw for several neutral wires. Is this permissible?"—C.H.K.



A. While such connections may be permissible they are not desirable nor always satisfactory. Such connections are permissible, and approved by the Laboratories, only where separate lock washers are used, one for each wire. A connection block would be much better.

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110
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NEW...DEPENDABLE...BEND
SIZES OF PIPE WITH

S-36

BLACKHAWK
Porto-Power



This new, low-cost, super-range Blackhawk S-36 Porto-Power Bender handles 7 sizes of pipe — 1 1/4" to 4"! Pays for itself in savings of time — provides speedy set-ups — is light in weight — rolls to the job — and is powered by Blackhawk's famous 20-ton all-directional hydraulic remotely controlled Porto-Power ram. Porto-Power Hydraulic Units are **DEPENDABLE**, as service-proved through years of maintenance-free performance in many other applications. Ram retracts automatically at finger-turn of release valve for quick re-positioning of pipe. Also used with special attachments for pulling pulleys, gears, etc., and for wide range of press, push and lift jobs in construction and maintenance.

A Product of
BLACKHAWK MFG. CO., Dept. 20119, Milwaukee, Wisconsin

S-30A HANDLES 4 SIZES

The new S-30A Porto-Power Bender has practically all features of larger S-36 — but includes 10-ton instead of 20-ton hydraulic unit. Handles 1", 1 1/4", 1 1/2" and 2" diameter pipe and rigid conduit. All-directional, remotely controlled ram permits use on ladders, scaffolds and in cramped quarters. Costs only \$97.25 — slightly higher on West Coast and in Canada.

Order S-36 or S-30A from your Industrial Supply House TODAY — or send coupon for catalog and prices.



BLACKHAWK MFG. CO., Dept. P20119, Milwaukee, Wis.

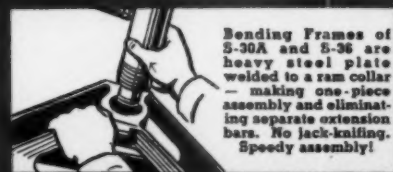
RUSH new Pipe Bender Catalog and prices also name of nearby distributors.

Name.....
Company.....
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Exclusive
NEW FEATURES



"Pull-Pins" with "Lock-On" fittings hold Pivot Shoes in Bending Frames of S-30A and S-36. Easily removed and inserted. No nuts, bolts — no wrenches.



Bending Frames of S-30A and S-36 are heavy steel plate welded to a ram collar — making one-piece assembly and eliminating separate extension bars. No jack-knifing. Speedy assembly!



Pivot Shoes on S-36 have extra-wide rims which serve as wheels for rolling unit along floor. No carrying necessary while on job.

SOLD THROUGH ESTABLISHED INDUSTRIAL SUPPLY HOUSES

BLACKHAWK

Better Lighting

FLUORESCENT PLUS INCANDESCENT

Lighting for selling more and more combines fluorescent and filament lamps. The Jos. Schloss & Son Co. of Baltimore have a good example.

This store is 50 feet long and 18 feet wide with a 12 foot ceiling. General



CHARACTER is expressed in this combination of coves, silhouette signs and recessed spots.

illumination is provided by 9 recessed Pittsburgh FE-500-C units, spaced 9 feet apart and equipped with 300-watt lamps, to give 35 footcandles. Silhouette signs mark the location of various kinds of merchandise. The wall displays use daylight fluorescent lamps. Forty-one 36-inch lamps are used.

LIGHTING FOR INSPECTION

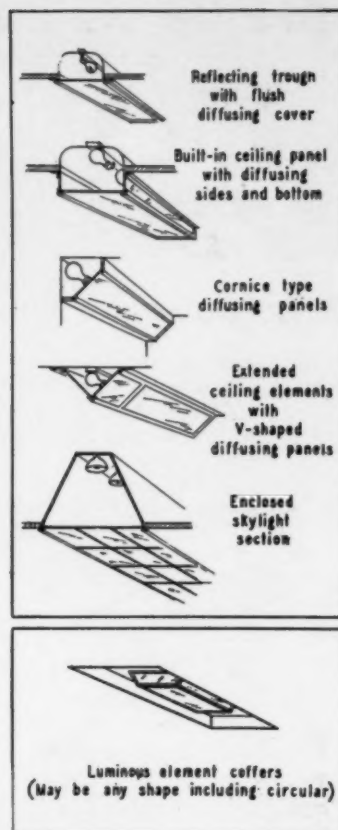
Sixty-five footcandles of illumination are provided in the Inspection Department of the Davenport Hosiery Mills

in Chattanooga, Tennessee. Mercury and incandescent lamps are used in Glassteel Diffuser equipment. Forty units are employed. Each is equipped with a 500-watt mazda lamp and a 250-watt mercury lamp, making a total of 750 watts per unit. The units are spaced on 9x12 foot centers and mounted 11 feet above the floor.

The mazda lamps are operated at 115 volts and the mercury lamps from the usual transformer-reactor type of auxiliary equipment. There is an average of 7 watts per square foot and the utilization factor is 54 per cent. The working plane is 3½ feet above the floor. The photograph shows the method of mounting and locating the auxiliary equipment.

LUMINOUS ELEMENTS

Luminous panels and projecting elements are important architectural forms, adaptable to many conditions and manners of decoration. They offer a choice of many translucent materials varying in texture and appearance, both lighted and unlighted. They can be made to harmonize with surroundings both in physical scale and decorative



LUMINOUS EFFECTS may be provided in a variety of ways, to suit conditions in the building.

interest. From the standpoint of illumination, they present a means of obtaining large area, low brightness sources, with ample dimension to accommodate lamps and wiring for color circuits. Uniformly luminous elements faced with cased-opal glass have been most widely used, but often more subtle and charming results are obtained by the use of graded brightness to produce highlights or sparkle.

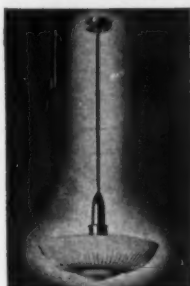


FOR INSPECTION—Davenport Hosiery Mills now has 65 footcandles on inspection tables using combination mazda-mercury unit.

LIGHTING SATISFACTION

WITH WESTINGHOUSE
QUALITY EQUIPMENT

Westinghouse Styling and Performance Build Confidence



A dignified, glareless and inviting atmosphere is created by this new GB Bipost installation in the Central Trust Company Bank at Rochester, N. Y.



For Commercial Installations

Smart styling, high efficiency, glareless lighting — these are the features that appeal. Both the GB Luminaire for Bipost lamps and Magnalux for screw base lamps are equipped with basins of the new Hi-Flec Glass to provide more even and lower surface brightness and higher reflecting efficiency and 20 percent less weight. Basin support rods for both units offer a distinctly new feature in commercial lighting — a variable light cutoff.

★ ★ ★

For Industrial Installations

The exclusive Westinghouse LOCKLITE principle opens a new measure of economy in industrial lighting. LOCKLITE is now available in a wide range of reflectors, and is suitable for all normal industrial lighting applications. A twist of the wrist and LOCKLITE is attached or disconnected... and it lights as it locks. It reduces maintenance costs and saves in cleaning costs. Westinghouse now makes available a wide range of Fluorescent Reflectors for industrial applications.

★ ★ ★



The exclusive Westinghouse LOCKLITE principle brings interchangeability, reduced maintenance costs and greater safety to industrial applications.



Shibe Park, home of the Philadelphia Athletics, and Comiskey Park, home of the Chicago White Sox, are lighted by Westinghouse VHR Floodlights.

For Floodlighting Installations

Westinghouse floodlights are unexcelled, both mechanically and photometrically, in quality and performance. New type VHR units light Shibe Park in Philadelphia and Comiskey Park in Chicago... and were specifically designed to light sportsfields. Inexpensive, lightweight and weathertight, Westinghouse floodlights are available for athletic fields, service stations, construction projects, industrial yards and wherever controlled light coverage is required.

Call your nearest Westinghouse Distributor or write Westinghouse Electric & Mfg. Co., Lighting Division, Cleveland, O.

Westinghouse

Lighting
Equipment





Lamps for the Entire Office

Illustrated is just one of the many models of this attractive and efficient lamp. It provides indirect room illumination, with restful, glareless light thrown directly on the work, to lessen eye strain and fatigue—increase accuracy and production.

Styles to clamp on desk, stand on desk or floor, or attach directly to billing machines or other office appliances. The line has strong sales appeal and wide application to office needs.

Lamps for All Purposes

For 59 years the Faries Line has represented the best in portable lighting equipment. National advertising is regularly reaching executives whose decisions influence the purchase of lighting equipment.

Get This Big Catalog

Over 200 lamps—a complete line of brackets, fixtures and supplies. An effective help in selling more lighting equipment.



FARIES MFG. CO.

S. Robert Schwartz Div.
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Decatur, Ill.



No. 2242
Guardman



No. 1988
Natural Light



No. 2231
Indirect Desk Lamp



No. 141
Adjust. Bracket



No. 41
Bench Light



No. 10-000
Bench Light



No. 27
Parabola Shade



Brass
Flexible Arm



[FROM PAGE 48]

The exact character of element employed for any location will depend on architectural design, being regulated by the space or recess depth available and by structural requirements. Many types of both recessed and projecting elements are now listed in manufacturers' catalogs.

For uniformly lighted areas using good diffusing materials—cased-opal glass, plastic sheets, or translucent marbles—the spacing of lamps should not exceed $1\frac{1}{2}$ times the distance of the filament from the material. For less diffusing materials, the spacing must be smaller or the lamps may be shielded. In general, varying brightness unless deliberately and skillfully planned is apt to look ragged. The brightness of interior elements may range from 75 to 1000 foot-lamberts depending on (a) the amount of surrounding illumination, (b) brightness contrast with adjacent surfaces, (c) position and size of elements, (d) casual or prolonged viewing.

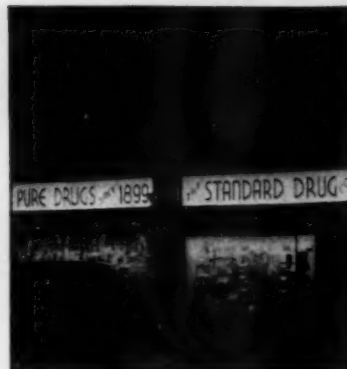
These architectural lighting schemes differ from so-called luminous elements in that the surfaces become luminous by reflection, rather than by interposing a translucent material. The most common method is to conceal lamps in cornices or around the edges of recesses. Other methods employ silhouette strips or artificial beams which approach in technique the use of suspended troughs, urns or built-on ledges.

COLOR DISTINCTION IN STORE SIGNS

The daylight fluorescent lamp has been used on several stores of the Standard Drug Company at Cleveland. It gives a distinctive color that stands out in contrast with the surrounding displays.

The transom area is blazed with translucent white tempered enameled glass carrying the sign message in translucent red enamel. The panels are backed with an enclosure finished in white, with removable rear panels allowing ready access for lamp replacement, cleaning and repainting.

The luminous panels are 30 inches high; two 17 ft. long and two 15 ft. 4 in. long. Three horizontal rows of glass are in each panel. For each row of the longer panels, four 48-inch T-12, 40-watt lamps are used with adjacent sockets spaced 3 ft. apart. Magnetic switch type auxiliaries are used. The



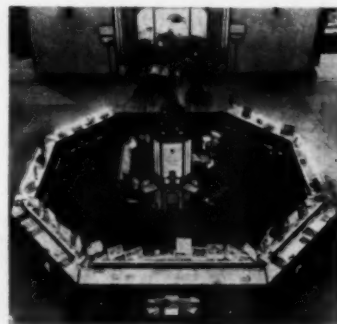
TO STAND OUT among the neighboring stores, these signs use color contrast effectively. Daylight fluorescents did it.

total wattage, including auxiliaries, is about 2,200.

CASE TOP FLUORESCENTS

The fluorescent lamp is finding wide use for candy cases, as in this Martha Washington Candy Counter in the Pittsfield Building, Chicago. The candy counter is octagonal, seven of the sides being showcase and the eighth side a railing and gate.

The cases are small and a little above the average in height. They are lighted from the special trough which merely rests on the top front edge. This trough



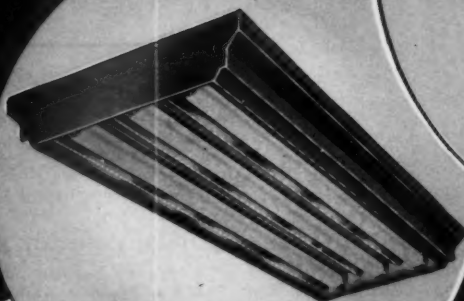
ISLAND COUNTER—A difficult lighting condition well handled by tubes that merely lay upon the case tops.

delivers excellent lighting through the top glass into the case. Also, the inside upper part of the trough is cut away to permit light to go upward and backward against the candy boxes and signs on top of the case.

The top slot is protected with cross louvers about 2 inches apart. These shield the eyes from direct view of the lamps at the various angles. Five 15-watt T-8 white lamps are used on the long front side of the unit. Three 15-watt T-8 white lamps are on each of the other six sides, making a total of 23 lamps in all.

Day-Brite

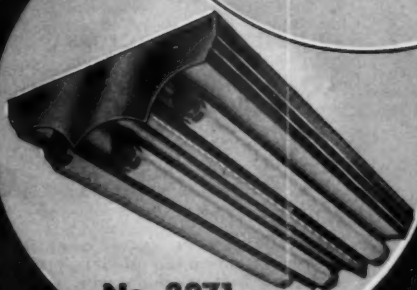
Fluorescent Lamp Fixtures



No. 5324



No. 3780



No. 3271



No. 2224

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*Combine Efficiency,
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Day-Brite manufactures a complete line of correctly engineered general lighting fixtures for commercial installations. They are made in a wide range of sizes for various Fluorescent lamps.

A few typical styles are shown here. They can be used as individual units or can be butted for continuous installations.

No. 3780—This series is available for two, three, four and five 24" and 48" lamps; for suspension or ceiling mounting.

No. 5324—Ceiling fixtures for two, three and four 24", 36" and 48" lamps.

No. 3271—Units for two and three 18", 24" and 48" lamps; for suspension or ceiling mounting.

No. 2224—Surface fixtures for one, two and three 18", 24", 36" and 48" lamps.

Catalog No. 110 illustrates the Complete Fluorescent Line. Write for it Today

Day-Brite Lighting, Inc.

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turers without cost or obligation—

PORTABLE ARC WELDERS

1. Bulletin GEA-3081B is a folder describing a new line of low-current portable arc welders. 100, 150, and 200 ampere sizes. Power supply either 220 or 440 volts, 2 or 3 phase, 60 cycles. Descriptive and performance data given. General Electric Co.

SPEED CHANGER

2. Bulletin B6013 is a 20-page booklet covering illustrations, general descriptions and technical information on the new vari-pitch speed changer for variable speed transmission. Allis-Chalmers Mfg. Co.

PORTABLE INSTRUMENTS

3. Catalog No. 123 has 20 pages of general descriptive and technical data on portable alternating and direct current instruments and portable current transformers. Roller-Smith Company.

LIGHTING UNITS

4. Catalog Section 61-266 discusses Sollite direct lighting units. Also lists prices. Westinghouse Electric & Mfg. Co.

AIR CIRCUIT BREAKERS

5. Bulletins GEA-2539B and GEA-1662C give general descriptive, technical and dimensional data on type AL-2 air circuit breakers for office buildings, industrials and power stations. Sizes 100 to 1600 amperes at 250 and 600 volts a.c., 250 and 750 volts d.c. Larger breaker ratings of 2000 to 6000 amperes at 600 volts a.c., and 2000 to 10,000 amperes at 750 volts d.c. General Electric Co.

FLUORESCENT FIXTURES

6. Bulletin F-12 featuring fixtures for fluorescent lamps. They are furnished completely wired and include auxiliaries and sockets, ready for installation. Day-Brite Lighting, Inc.

POWER TAP SWITCHES

7. Data sheet 114 gives complete information on Ohmite high-current power tap switches, single and tandem units. Ohmite Manufacturing Co.

MULTI-BREAKER

8. A folder illustrating and describing Type "MO" multi-breaker for home, factory and farm use. Colt's Patent Fire Arms Mfg. Co.

FLUORESCENT LIGHTING UNIT

9. Bulletin No. 61 features the "Knit-Master" fluorescent lighting unit for illuminating the needle bar of full-fashioned hosiery machines. Wheeler Reflector Co.

TOOLS

10. Catalog No. 26 consists of 27 pages of drop forged tools, such as wrenches, pliers, tinner's snips, screw drivers, hammers, tool kits, wrench sets. Barcalo Manufacturing Co.

VENTILATING FANS

11. A 16 page catalog of exhaust and ventilating fans for commercial, industrial and domestic installations. Features engineering, application, dimension and cost data. The Emerson Electric Mfg. Co.

SPECIAL LIGHTING

12. A descriptive folder with data sheet giving application, dimension, distribution and foot candle information on concealed "Downlites" for special lighting. Rambusch.

STREET LIGHTING

13. An eight page illustrated folder on street lighting luminaries. The Daunt Corp.

INSTRUMENTS

14. Bulletin No. 150 illustrates and describes groundmeters. It gives the measurements, construction, operating principle. Borden Electric Co.

INSTRUMENT TRANSFORMER

15. Booklet B-2213 consists of 12 pages illustrating and describing a new line of instrument transformers. Westinghouse Electric & Manufacturing Co.

PAPER PULLEYS

16. Booklet No. 860 describes paper pulleys for industrial use includ-

ing different types for special conditions and applications. Features a complete list of stock sizes with price list. Rockwood Manufacturing Company.

SLIDING-CONTACT RHEOSTATS

17. A bulletin describing a new graphite lubricator with the phosphor bronze brushes on the Jagabi Sliding-Contact Rheostats. Improves the electrical contact and reduces brush wear. James G. Biddle Company.

SOLDERLESS CONNECTORS

18. Catalog 41 is a condensed industrial catalog on electrical connectors. Features engineering, cost, and illustrated descriptive data on all types of solderless connectors. Burndy Engineering Co., Inc.

PIPE MACHINES

19. Bulletin A gives complete information on Model A portable pipe and bolt machine with automatic oiling. Bulletin C gives full information on the Model C compact power unit which enables hand tools to do the work of electric tools. Descriptive and cost data given in both bulletins. Beaver Pipe Tools Inc.

ELECTRIC PUMP

20. A bulletin describing the new Motorpump. Features a cut-away illustration of the pump showing the complete unit with a built-in electric motor. Sizes from 5 to 1000 gals. per minute, heads to 500 feet and motors to 40 hp. Ingersoll-Rand.

TRANSFORMERS

21. Bulletin GEA 3085A, with 12 pages of illustrations, specification, dimension and cost data on the new single phase oil immersed "Spirakore" distribution transformers. The General Electric Co.

ELECTRIC WELDER

22. A descriptive folder on the new 150 ampere portable welder. Illustrations are included. The Lincoln Electric Company.

D-C SWITCHBOARDS

23. Descriptive Data 31-132 covers 23 small-plant and industrial d.c. switchboards with fuses and knife switches. Westinghouse Electric and Mfg. Co.

INDUSTRIAL EXHAUST FANS

24. Descriptive bulletin No. 201-A gives technical and dimensional data on acid-moisture proof and vapor-explosion proof propeller fans. Autovent Fan and Blower Co.

WELDING GOGGLES

25. A four page leaflet explaining the function and necessity of protective lenses for arc welding. The Lincoln Electric Company.

ELECTROLYTIC CAPACITORS

26. Catalog No. 162A gives a complete listing and cost data on electrolytic capacitors for motor starting. Cornell-Dubilier Electric Corp.

STEP VOLTAGE REGULATORS

27. Publication GEA-1577E gives complete information on type MLT-16/32 step voltage regulators. Many illustrations and diagrams are given. General Electric Co.

ARMORED CABLE

28. Catalog No. 189 consists of 16 pages of information on armored cable. Data regarding thermocable for air conditioning systems and heating apparatus are given. Hazard Insulated Wire Works.

METERING EQUIPMENT

29. Two descriptive folders covering standard troughs and instrument transformer metering equipment for socket type meters and trough type current transformers. Weatherproof construction for indoor or outdoor mounting. Descriptive and dimensional data given. Anchor Manufacturing Co.

FIBRE CONDUIT

30. A descriptive folder telling where and when to install fibre conduit without concrete encasement. The Fibre Conduit Co.

CAPACITOR SELECTOR

31. A descriptive folder covering the motor-starting capacitor selector and emergency capacitor combined to make a first-aid kit for the refrigerator serviceman. Aerovox Corporation.

MOTOR LUBRICATION

32. A three color bulletin describing the new "Lubriflush" system of motor lubrication. Features cut-away illustrations showing the application of this system. U. S. Electrical Motors Inc.

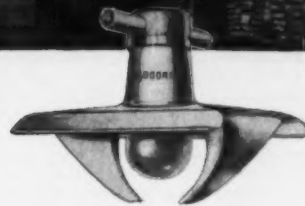
OIL-LESS CIRCUIT BREAKERS

33. A brochure giving complete descriptive and technical data on the tests of the new air-blast and magneblast high-voltage circuit breakers. Bulletin GES-2356. General Electric Co.

(Continued on Page 74)



THIS FIXTURE Gives You Better STOCK ROOM LIGHTING



What a difference it makes when stock clerks can read comfortably anywhere in the aisles! It means better working conditions; faster, more accurate filling of orders with proper illumination from top to bottom shelves and into bin interiors. Yet there's no glare in the aisles to cause eye fatigue. Through the scientific use of reflection, this fixture directs light where it is most needed, uses the lamp's full intensity, gives you the illumination you're paying for.

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THERMO-MAGNETIC RELAYS

34. Catalog 12-a is an eight page booklet giving descriptive, technical and dimensional data on a new line of type DT-1 thermo-magnetic relays designed especially for motor, generator and transformer protection. Roller-Smith Company.

TANK PAINTING PROBLEMS

35. A folder explaining how to obtain maximum results in painting interior and exterior surfaces on all types of tanks and supporting structures. Asphalt Paint Company.

WELDER

36. Bulletin No. 334 describes 200 ampere "Shield-Arc Junior" welder, belted or direct-driven model. Lincoln Electric Co.

PARKWAY CABLE

37. Bulletin GEA-3244 covers single, two, and three conductor types of RR-tellurium parkway cable. General descriptive, technical and dimensional data given on sizes No. 14 to 500,000 cm., 600, 2500, and 5000 volts. General Electric Co.

SWITCHGEAR

38. Bulletin B6011 is an illustrated pamphlet giving descriptive and dimensional data on indoor cubicle type switchgear. Bulletin B-6012 gives similar information on metal-clad vertical-lift switchgear. Bulletin B6016 features application, engineering and descriptive data on the type TLB load ratio control apparatus. Allis-Chalmers Mfg. Company.

INSULATION

39. A new insulation folder giving suggested applications of fibre insulation. Wilmington Fibre Specialty Company.

FLUORESCENT LIGHTING FIXTURES

40. Bulletin No. 60 gives 17 pages of illustrated, engineering, dimensional and cost data on various industrial reflectors for fluorescent lamps. Wheeler Reflector Company.

trial reflectors for fluorescent lamps. Wheeler Reflector Company.

AIR CIRCUIT BREAKERS

41. Catalog No. 5 is a new 12 page booklet giving complete and up-to-date technical and general data on Type HD heavy duty air circuit breakers. Roller-Smith Company.

SWITCHGEAR

42. Bulletin GEA-2596A is a 16 page publication giving general descriptive, technical and dimensional data on metal-enclosed switchgear with draw-out air circuit breakers for low voltage feeders. Ratings up to 10,000 amperes at 600 volts a.c., 250 volts d.c. Interrupting capacities to 80,000 amps. General Electric Co.

CONTROLS

43. Bulletin No. 40 illustrating and describing electric floatless liquid level controls, signal and pump controls, motor starters and relays. Bender Warwick Corp.

TRANSFORMERS

44. A folder featuring air cooled transformers for industrial applications. Prices are given. Ferranti Electric, Inc.

MULTI-BREAKER

45. A four page folder illustrating and describing Type "M.O." Multi-Breaker. Details of construction, applications, design and operation. Trumbull Electric Mfg. Co.

REFLECTORS

46. A folder featuring reflectors to accommodate all infra-red lamps. Includes illustrations, data and specifications. Fostoria Pressed Steel Corp.

PROTECTIVE DEVICES

47. Catalog GEA-2634 entitled "How to Select Protective Devices for Low-Voltage Power Circuits". Many illustrations. General Electric Co.

"QUICK SELECTOR"

48. A 60-page catalog called "Quick Selector". Contains data and illustrations on safety switches. Nofuse breakers, multi-breakers, panelboards, motor control and motors. Westinghouse Electric & Mfg. Co.

ROTARY SWITCHES

49. Catalog No. 9 featuring Type R-2 rotary switches, instrument and control, indicating lamps. Illustrations and diagrams of connections are given. Roller-Smith Co.

INDUSTRIAL CAPACITORS

50. Catalog No. 164, 36 pages, gives data on industrial capacitors for motor starting and other a.c. applications. Also data on physical and electrical characteristics. Cornell-Dubilier Electric Corp.

LIGHTING

51. A handbook of localized lighting presenting application data on the Fostoria canopy localite, a large area, low brightness unit and small flexible area units, including accessory and assembly combinations. Fostoria Pressed Steel Corp.

SPOT LIGHTING

52. A bulletin illustrating and describing Mite Lite, a tiny focusing spotlight for color lighting in show cases, windows and displays. Display Stage Lighting Co.

FLUORESCENT LIGHTING

53. Bulletin No. 34 featuring Frostolite fluorescent lighting equipment for commercial use. Many illustrations are given. Samuel Frost.

ELECTRICAL SPECIALTIES

54. A 44-page catalog illustrating and describing a complete line of more than 1200 electrical specialties and wiring devices. Eagle Electric Mfg. Co.

REFLECTORS

55. Catalog 39 illustrating and describing fluorescent reflectors, lighting units and incandescent recessed fixtures. Garco Reflectors.

HAMMER HAND-BOOK

56. A handbook of portable electric hammers. Gives details of operation, typical uses, list of available hammer tools and special pointers on maintenance and operation of the tool. Many illustrations included. Van Dorn Electric Tool Co.

PIVOTED MOTOR BASE

57. Booklet 861 presenting price and dimensional information for various types of bases available for different applications. Rockwood Manufacturing Co.

MOTORS

58. Bulletin GEA-968 illustrates Type RB motor, single-phase, repulsion, brush-shifting, reversible or non-reversible. GEA-1698A describes wound-rotor induction motors, Types M, MT. GEA-1807B features squirrel-cage induction motors, Types KT, FT and FTR. General Electric Co.

Circle numbers, sign and paste on a penny postcard or mail in an envelope.

ELECTRICAL CONTRACTING

330 West 42d St.
New York, N. Y.

November

(Not good after January 1)

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

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16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
46 47 48 49 50 51 52 53 54 55 56 57 58

NAME..... TITLE.....

COMPANY.....

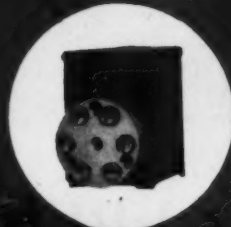
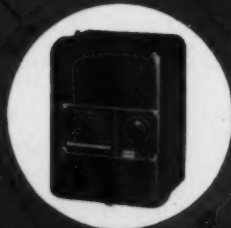
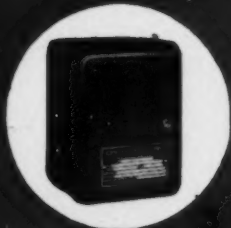
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USE CONTROL

To Cut Manufacturing Cost

This CR7006 magnetic control starts or stops the motor upon impulse from one or more of the pilot control devices.



THERE'S nothing difficult about making manufacturing operations automatic. In many cases the correct motor plus properly selected G-E control will do the required job. Why G-E?—because General Electric offers *more different types* of control devices. The devices shown here are typical of the many efficiency-boosting G-E automatic controls.

1. Manual Push-button—By far the most widely used control, the finger-, palm-, or foot-operated push-button (CR2940) makes it possible to start a motor from one or more remote points—also supplements other pilot controls for manual operation.

2. Mechanical Limit—As a safety device to prevent overtravel, as an automatic means for stopping or reversing travel, or as a means of interlocking motion use a push-rod-, lever-, or gear-type limit switch (CR9440).

3. Light Beam—By far the most fascinating—and the most versatile—the photoelectric relay (CR7505) operates upon interruption of a light beam—opens doors, protects workers, acts as a limit switch, controls lights, etc.

4. Time-delay—Time plays a part in automatic control of motors. Wherever operations must be timed accurately or repeatedly, a vacuum-tube timer (CR7504) affords a dependable solution.

5. Pressure or Vacuum—Accurate pressure and vacuum switches (CR2927) offer control according to pressure of gas or liquid in a container.

Send for Bulletins

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Please send me publications which discuss
the pilot devices and controls shown above.

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GENERAL  ELECTRIC

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... and flowers

Illustrated on this page is the first Tung Oil tree planted in the United States. Its planting near Tallahassee, Florida in 1908 marked the beginning of a new American industry. Today southern Tung plantations are producing oil superior to the China Wood Oil imported from the Orient.

In keeping with its established policy of utilizing every modern development that would bring its customers a better product, the JOHN C. DOLPH COMPANY has conducted considerable research and experimentation with this American Tung Oil.

The JOHN C. DOLPH COMPANY is happy to announce that as a result of this research and because of favorable negotiations with the General Tung Oil Corporation, all future shipments of CHINALAK Insulating Varnishes will contain only American grown Tung Oil. The many outstanding advantages in favor of this domestic oil enable us to be still more confident in our unconditional guarantee of the uniform high quality of CHINALAK.

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MAINTENANCE MEANS REPLACEMENTS

MAINTENANCE does not always involve the repair of operating equipment. Often, to maintain service, means replacing the faulty devices in the wiring system. To do this efficiently, the maintenance man must know what to replace. And if he is up on new developments he will use the latest—the best thing for the job.

Men in large plants dealing with important motors, controls and operating equipment are often prone to forget about the lesser features of the system, conduit fittings and wiring devices. In many cases, newer and better devices can be used to replace defective ones, with less chance of failure in the future. The maintenance man must know what to select and how to apply it. And when he is not sure he should have a quick and simple way of securing this information.

For this reason these Maintenance Guide Sheets this month cover a review of the selection and application of typical wiring devices and fittings.

1. Alternating Current Motors—Types and Applications
 2. Direct Current Motors—Types and Applications
 3. Alternating Current Motors—Maintenance
 4. Direct Current Motors—Maintenance
 5. A.C. Motor Starters and Controllers—Types, Applications
 6. D.C. Motor Starters and Controllers—Types, Applications
 7. Maintenance of Control Equipment
 8. Special Control Problems—Heavy Installations and Maintenance
 9. Electric Distribution
 10. Lighting
 11. Electric Heat
 12. Electric Welding
 13. Interplant Communication
 14. Instruments
 15. Power Tools
 16. Batteries and Rectifiers
 17. Electroplating
 18. Electronic Devices
 19. Circuit Breakers
 20. Equipment for Hazardous Locations
 21. Transformers
 22. Wiring Devices and Fittings (this issue)
- Coming articles will discuss
23. Wire and Cables
 24. Drives
 25. Elevators, Conveyors, Cranes and Trucks
 26. Ventilating and Air Conditioning Equipment
 27. Management of Maintenance

Maintenance

WIRING DEVICES AND FITTINGS

Selection and Application

WHEN a circuit is to be run, the electrical maintenance man has available a wide variety of wiring devices and wiring fittings. An important step in the eventual maintenance of these devices and fittings is their proper selection and application at the time of installation. Therefore, a review of the selection will have some practical value.

The necessity of using approved devices and fittings with adequate capacity cannot be emphasized too strongly. Principal services and standard voltage ratings of wiring devices and fittings for use in industrial plants and commercial buildings are:—lighting, on a.c. and d.c. circuits up to 250 volts; power, on d.c. circuits up to 250 volts and on a.c. circuits up to 600 volts; signals and alarms, on a.c. and d.c. circuits up to 125 volts.

A definite trend is to the use of devices designed for heavy duty service. Naturally, this requires fittings of suitable size and construction. Ratings, construction and installation are governed by the N.E.C., and local codes.

Installation of the devices and fittings must be considered from the following standpoints:

1. *Mechanical*, such as for concealed or exposed work, and flush or surface mounting;
2. *Electrical*, such as for number of circuits and light or heavy duty service;
3. *Atmospheric conditions*, such as ambient temperature and dry, dusty, damp and hazardous locations.

Proper selection and installation of

devices and fittings should eliminate the maintenance problem. However, if failure should occur through accident or misuse, the best policy is to make a replacement. Construction of the devices and fittings is such as to render them practically impossible to repair.

Wiring Devices

Wiring devices cover the following

CONVENIENCE—Power brought nearer to the job. A duplex receptacle with metal cover fastened to an outlet box. (Bryant Electric Company photo.)





ON THE CEILING—Pull switch with porcelain base, and lighting fixture (back) are mounted on "pancake" or shallow outlet boxes.

main division of major equipment:

- Lamp sockets and holders.
- Receptacles and plugs.
- Switches.

1. Selection of lamp sockets and holders depends upon the size of lamps to be used, the location and the surrounding external conditions. Sockets and holders are available in a wide variety of shapes, materials and adaptations, and may be wired in the several usual methods. Many lamp sockets incorporate a switch as an integral part of the device. It may be either of the lock, pull, push, rotary, or toggle type.

The "medium base" socket is the form most commonly used. These sockets are available in two standard ratings—250 and 660 watts, 250 volts—and are suitable for standard lamp sizes. However, if the sockets carry loads greater than their respective ratings, their life is shortened materially.

Other forms of lamp sockets and some of their applications are:

1. *Mogul*, capacity 660 to 1500 watts, for lighting large interiors, floodlighting, stage lighting, and street lighting.
2. *Intermediate*, capacity up to 25 watts, 125-250 volts, for decorative lighting and other applications where a low-cost, low-wattage lamp is required. Also used in places or devices where size is an important factor.
3. *Candelabra*, capacity and application same as intermediate, except that this device can be used only on circuits of 125 volts or less.
4. *Miniature* base, capacity 75 watts, 125 volts, used where very small size is required and usually on low-voltage or series devices.

Mounting position, location and wiring system determine the type of holder to be used. Obviously, if for outdoor service, weatherproof types should be used, and for varying degrees of hazardous conditions, the respective forms should be selected.

Fluorescent and lumiline lamps re-

quire sockets and holders of forms particularly adapted for these types of lamps.

2. *Receptacles and plugs* have a great variety of types. Their selection and application are dependent likewise on load and location. Adequate capacity and sturdiness are prime requisites. The capacity of a receptacle is determined by N.E.C. article 210 and local ordinances. The rating of a receptacle is stamped on the device along with the underwriter's label. Plugs of a certain rating will fit only into receptacles of the same rating.

The location of outlets or receptacles is important to convenience and cleanliness. An "ordinary" receptacle should never be located where excessive moisture or large amounts of dirt are liable to affect the device. Special types should be selected to meet these conditions, as well as for outdoor and hazardous locations.

Polarized devices are available for special circuits, and ratings range from 10 amperes to 50 amperes, 250 volts. Special conveniences are available in the twist lock type, three and four wire devices, circuit breaking and other specific purpose devices.

Polarization of receptacles has two purposes: (1) to identify wiring so that the correct conductor and terminal on the receptacle will be connected always to a respective lead in the plug; (2) to prevent mistaking a special circuit for the standard circuit. The need for polarization of two-wire circuits depends upon the application. All circuits with more than two wires are polarized, and all systems of 150 volts and over are required by N.E.C. to have polarized devices.

As a safety measure with portable tools and machinery or wherever shock hazards are evident, the unit should be grounded to the neutral connector of a polarized device.

Plugs should have sturdy construction and preferably be furnished with cord strain relief attachments.

Heavy duty types of plugs, receptacles and extension cable connectors are being used more extensively for general purposes and in places where excessive corrosion exists. This type has an extended receptacle housing and plug sleeve, and provides for grounding. Some forms have a circuit breaking and safety device which has no exposed live parts to endanger the operator.

Plugs and receptacles carrying the Underwriter's Laboratory label are able to break their rated load and may be used for disconnecting purposes. But a motor, appliance or other load should always be disconnected by its own switch rather than by pulling on the

cord to remove the plug from the receptacle. The latter method chafes the wires and shortens the life of the cord; also, the disrupting arc burns and pits the bronze of the plug. This applies as well to cord connectors.

An adequate supply of outlets and receptacles is very important, particularly when portable machines or lamps are used. Installations such as the two- and three-receptacle outlets provide maximum utility.

A pilot light mounted as a unit with a switch or plug receptacle is valuable to indicate when the circuit is "hot".

3. *The wiring device type of switch* is adaptable for service on lighting, small motors and resistive loads. These switches may be used on both a.c. and d.c. circuits and have ratings which cover a large range of amperage and voltage. Switches integral with light sockets are usually rated 250 or 660 watts, 250 volts. These ratings should not be exceeded by using too large a lamp or by controlling some other device other than a lamp.

When a switch is used for controlling a lighting circuit, various factors must be considered. If tungsten lamps provide the main load, the switch must have a "T" rating to stand up satisfactorily in that service. Most of the small switch failures are due to the use of tungsten lamps as the load. Lamps with tungsten filaments draw from eight to fourteen times as much current when they are cold as when they are hot; thus a heavy inrush of current damages the switch contact.

Also, a switch should not be used for controlling a motor, unless it has a horsepower rating equal to or greater than that of the motor. An a.c. motor draws six times its rated full load current when started on full voltage or stalled at a low power factor. A d.c. motor draws ten times rated current under the same conditions.

Switches without a horsepower rating will usually fail, if the motor accidentally stalls and the switch is turned

AT THE WORKBENCH—Duplex outlet serves a glue pot and a motor; a "T" conduit fitting provides a connection for a lamp.



MAINTENANCE GUIDE SHEET—WIRING DEVICES AND FITTINGS

WIRING DEVICES — Types in Common Use

LAMP SOCKETS AND HOLDERS

Industrial Key Socket with Threaded Catch for Lamp Shade.

Outlet Box, 1-Place Porcelain-Pull Socket with Shadeholder Groove.

Aluminum Socket with Cord Grip Cap.

Bakelite Weatherproof Socket with 6-in. Leads.

Bakelite Socket for Fluorescent Lamp, Flush or Surface Mounting.

RECEPTACLES AND PLUGS

Duplex, Flush, Receptacle, Supplied with Ground Shunt.

Sign and Fixture Porcelain Receptacle with Clip Terminals.

Polarized Plug Cap with Cord Grip.

Heavy Duty, 4-wire, Circuit Breaking, Grounded, Angle Weatherproof Receptacle.

Polarized Receptacle with Metal Cover for Outlet Box.

SWITCHES

Tumbler Switch, 1 and 2 Pole, 3 and 4 Way.

Ceiling Pull Switch, Back Wired, with Outlet Box Cover.

Snap Switch, Surface Mounting, 1, 2 and 3 Pole, and 3-Way.

Snap Switch, Surface Mounting, With Outlet Box Cover, Single Pole, and Double Pole.

Motor Starting Switch, 2 HP, 220 to 600 Volts, Single and Three phase, 2, 3 and 4 Pole.

MOTOR BASE, PENDENT SWITCH, CORD CONNECTOR, ROSETTE AND HANDLE

Flush Motor Base, Twist Lock, Midget Size for Polarized or Non-polarized Caps.

Pendant Switch with Cord Grip.

Polarized Cord Connector with Cord Grip.

Outlet Box Rosette, Porcelain, Without Terminals.

Rubber Handle, Turn Knob Socket, Takes Rubber Cord and Lamp Guard.

DAY'S WORK SELECTION OF WIRING DEVICES AND FITTINGS

BOX TYPES AND SIZES IN COMMON USE

Boxes	Size Inches	Depth Inches	Knockouts for Conduit, Inches
Outlet.....	4, 4½ square	1½, 1½, 2½	¾, ¾, 1
Ceiling.....	3½, 4 octagonal	1½, 2½	¾, ¾
Switch.....	¾, ¾, 4 round	¾, ¾, 1½	¾
Sectional Switch.....	2 to 10 gangs	1½, 2	¾, ¾
	3 x 2	2, 2½, 2½, 3½	¾, ¾, ¾

RIGID CONDUIT FITTINGS IN COMMON USE

Fitting Type	Hub Size Inches	Application
A.....	¾ to 6	Fitting for end of run. Hub at rear of body.
B.....	¾ to 4	Fitting for end of run. Hub on side of body.
C.....	¾ to 4	Fitting for through run. Hub at each end of body.
DER series.....	½ to 2	Explosion-proof and dust-tight junction boxes with square body.
E.....	¾ to 4	Fitting for end of run. Hub at one end of body.
EV series.....	½ and ¾	Lighting fixtures for hazardous locations.
FD and FS.....	½ to 1	Outlets having deep and shallow rectangular bodies.
G-H series.....	½ to 1	Outlets having shallow round bodies. Takes round-base wiring devices.
J-K series.....	½ to 1	Fittings for installations exposed to weather.
L.....	¾ to 4	Fittings for turns. Hubs on end, side or rear of body extended 45 or 90 deg. from hub on opposite end.
P series.....	½ to 1	Outlets having shallow round bodies. Take electroliners and 4 to 6-in. canopies.
PT series.....	1 to 6	"Pull boxes." Bodies 12 to 72 in. long.
SK series.....	½ to 1	Fittings for embedding in concrete.
T.....	¾ to 4	4½ in. deep.
U.....	½ to 2	Fitting for a run taken off at 90 deg. from a through run.
V series.....	½ to 1	Fitting for 90-deg. turn. Similar to type C except both end hubs extend 45 deg. from sides.
W series.....	½ and ¾	Vapor-proof lighting fixtures for lamp up to 200 watts. Not for hazardous locations.
WS series.....	½ and ¾	Fitting with plug receptacle set in. For installation over work benches.
X.....	¾ to 4	Fitting for receptacles, rosettes and switches.
Y series.....	½ to 1	Fitting for four runs, each 90 deg. apart.
Z series.....	½ to 1	Fittings for connection blocks and fuse cutouts. Fittings for round or rectangular base wiring devices and fuse cutouts.

Sketches courtesy Arrow-Hunt and Hegeman Electric Co.

WIRING DEVICES — Types in Common Use

LAMP SOCKETS AND HOLDERS

Industrial Key Socket with Threaded Catch for Lamp Shade.

Outlet Box, 1-Piece Porcelain, Pull Socket with Shadeholder Groove.

Aluminum Socket with Cord Grip Cap.

Bakelite Weatherproof Socket with 6-in. Lead.

Bakelite Socket for Fluorescent Lamp, Flush or Surface Mounting.

RECEPTACLES AND PLUGS

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Sign and Fixture Porcelain Receptacle with Clip Terminals.

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Snap Switch, Surface Mounting, 1, 2 and 3 Pole, and 3-Way.

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Outlet Box Rosette, Porcelain, Without Terminals.

Rubber Handle, Turn Knob Socket, Takes Rubber Cord and Lamp Guard.

Sketches courtesy Arrow-Hart and Hegeman Electric Co.

Sketches courtesy Arrow-Hurt and Hegeman Electric Co.



FOR OUTDOOR USE—Weather-proof connection box (right) and an entrance fitting at end of conduit, for incoming power service.

off. Also, the heavy inrush of current shortens the life of the switch, unless the switch is designed to meet these conditions.

Dust, dirt, and high temperatures are common causes of switch failures. So as it is impractical to inspect the wiring type of switch, and dangerous to attempt to clean or service it, a fully inclosed type of switch should be selected to minimize these sources of trouble.

The number of poles in a switch is determined by N.E.C. article 380 and 430 and by local requirements.

For special applications of switches, the usual weather, water, dust and explosion proof types are available, as well as convenient mounting means to suit all manner of conditions and systems.

Selection—A wiring device selected by the following rules should last the life of the building and the installation to which it is attached. It should be comparatively free of maintenance and inspection:

1. Determine the particular load and its characteristics.
2. Select a device with a rating equal to or higher than the load and suitable for its characteristics.
3. Select devices listed by Underwriters' Laboratories.
4. Use devices made by manufacturers of good repute, preferably one whose line covers most of the wiring device field.
5. Follow the rules of the N.E.C. and local codes, in full detail.
6. Follow Chapter 9, Table I of N.E.C. for allowable carrying capacities of conductors. Extra wiring capacity will prove a wise investment.

Boxes and Other Fittings

Whether circuits are to be run with armored cable, metallic tubing, non-metallic sheathed cable, in loom or rigid conduit, or as knob and tube work, various types and forms of fittings are required.

Selection of the fittings depends on

the following factors:

1. Structural design of building, which will have a bearing on whether concealed or exposed runs will be made.
2. Kind and location of service, which refers to the kind of power and service connection.
3. Capacity and number of conductors, which takes into consideration the load and number of wires to be run.
4. Location and kind of outlets, which determines where and how electric service is to be made available.
5. Atmospheric conditions, which takes into consideration the ambient temperature and chemical nature of the atmosphere.
6. Protection against abuse, which refers to conditions that could occur, such as excessive vibration, accident and flood.
7. Provision for future expansion, which refers to planning for possible needs to be met economically.
8. Local regulations and rules, which are based usually on N.E.C. and local codes.

Guiding Rules—Boxes are required at each outlet, switch and junction point, in a wiring system or where a change is made from protected wiring to open wiring. Special boxes and fittings having explosion-proof, vapor-proof and weather-proof features are required for particular locations.

Outlet, junction and switch boxes are available in sheet steel, either enameled or galvanized; cast and malleable iron, usually cadmium plated; non-corrosive metal or alloy; and porcelain. Construction of the boxes is governed by N. E. C. Section 103701.

Box size depends on one or more of the following conditions: location, number and size of conductors and conduit, and the purpose. In general, boxes should be used that have an internal depth of not less than 1½ inches. They can be obtained in various shapes, also with several accessories, such as brackets and ears for attaching to supports and clamps to secure conductors to the box.

Outlet and junction boxes must be of sufficient size to provide a specified free space for all conductors. The method for figuring the cubic inches to be allowed within the box for the number of wires is given in N. E. C. Section 3705, with specific rules covering installation practice.

Non-metallic outlet boxes may be used only with open work, concealed knob and tube work, non-metallic sheathed cable, or with non-metallic waterproof wiring.

Where two or more convenience outlets or switches can be installed at one place, the assembly can be made in gang boxes.

Rigid conduit fittings are numerous and varied, to suit the needs of the extensive use made of rigid metal wiring systems. This type of fitting ranges from ells and tees, through junction

and gang boxes, lamp holders, combination switch and cutout, to special units used in hazardous locations. They are available in sizes from ½ to 6 inches and with threaded or threadless hubs.

Care of Wiring Devices

Inspection of individual devices and fittings may be difficult because of their construction and location. It is a mistake, however, to assume that this type of equipment needs no maintenance and can just be left without attention until it fails. In buildings where vibration is excessive, a regular schedule of inspection is sensible and profitable.

Regular periodic inspection of wiring devices should be part of the maintenance schedule. The interval between checkups will depend on local conditions such as the amount of vibration, dust, corrosion or other factors that may cause trouble. Here are a number of things that should be checked if the system is to be maintained in proper working condition:

1. Check for loose terminal connections and tighten them.
2. See that stranded conductors are not chafed or broken. If they are, then make new connections.
3. Inspect plugs for burnt or bent prongs. It will be economical to replace the smaller plugs. Prongs of the heavy duty plugs can possibly be renewed.
4. Check cord grip on plug, for its "grip."
5. See that ceiling pull switches have the correct rating for the lamps in the respective circuits.
6. Inspect devices and covers for loose mounting and tighten screws.
7. Observe processes in various departments. Vapor, fumes, excessive dust and dirt may call for other types of devices and fittings.
8. Check pilot lights. Replace those that do not burn when circuit is "hot".
9. Check rating of socket receptacle against its load. Overload will shorten the life of a socket.
10. Inspect porcelain or composition devices. Replace them, if cracked or broken.



JUNCTION BOX (cover removed) used to conceal conduit and wire connections to surface mounted equipment.



Now a
**FLUORESCENT
LIGHTING UNIT**

Made to RLM Specifications

**ANNOUNCING A NEW RLM SPECIFICATION
FOR A 48" FLUORESCENT TWIN LAMP UNIT**

As a result of engineering studies and laboratory tests, carried on during the last few months, the RLM STANDARDS INSTITUTE announces the establishment of RLM Specifications for a new type of Fluorescent Lighting Unit especially designed for general illumination of Industrial and Commercial locations.

This unit makes available a new type of lighting. With the conventional 10 foot spacing and mounting heights, 20 foot-candles of daylight quality illumination are evenly and uniformly distributed over the working surfaces. Shadows are soft and luminous and there is no annoyance from glare or heat.

Salient points of these new units made in accordance with the new RLM Specifications are:

- A. *Porcelain Enamel Reflecting Surface for diffusion and durability.* Time has proven the durability, sustained efficiency and low maintenance cost of porcelain enamel. It is not affected by heat, cold or atmospheric conditions. It is easily cleaned.
- B. *78% Light Output Efficiency.* The design of the reflector, spacing of the lamps and high efficiency of the porcelain enamel reflecting surface combine to produce an unusual high light output efficiency.

C. *17½ Degree Cut-off.* An RLM cut-off standard for over 20 years and now generally accepted as good lighting practice. Insures adequate shielding of the light source to minimize glare. In addition the ends of the unit are closed to further protect the eye.

D. *Uses two 48" Mazda Fluorescent Lamps.* Approximately 100 watts used by lamp and auxiliary.

E. *New Type Auxiliary Corrects Power Factor and Flicker.* These auxiliaries are also equipped with removable and renewable starting switches located in the socket.

F. *Equipped with Auxiliaries Approved by the Underwriters' Laboratories.* All auxiliaries used in RLM units carry the approval of the Underwriters' Laboratories.

As with all RLM Lighting Units, the RLM Label affixed to a Fluorescent Lighting Unit is a warranty of conformance to RLM Specifications and is so attested to by the Electrical Testing Laboratories. This new RLM standard Fluorescent Unit will be available from manufacturers of RLM Lighting Equipment after December 15, 1939. New Specifications have been published giving complete information about this new unit. Ask your supplier of RLM reflectors or write Institute for a copy.

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

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RENEWABLE FUSES
 With the famous powder-packed element
KANTARK "ONE-TIME" FUSES
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 Color tells the size
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AUTOMATIC OILERS
 For motors, line shafts, etc.

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TRICO FUSES
STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS

Prepare Yourself For The Surprise of Your Life!

... when you see this new drill
 cut 75% off your drilling time
 in concrete, tile, etc.

You'll have to see for yourself to be convinced of the unbelievably fast hole drilling performance of the new Carboloy drill point. Drills holes 75% faster in concrete, tile, etc. Stays sharp up to 50 times longer.

A Virginia dealer writes: "All those who have tried the new Carboloy drill are *wildly enthusiastic* about its performance." An airport superintendent says: "Cuts our drilling time 95%."



A Virginia contractor reports: "Drilled 400 holes 7/8" diameter in concrete slabs in 2 days."

Get the facts about Carboloy Drills—the hardest metal made by man. Free folder from your dealer, or write direct.

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CARBOLOY
MASONRY DRILLS

FREE FOLDER

Hood Saves Checking Time

Even and diffuse lighting from a light-hood permits a stone-hand to make one precise, quick and complete check on a line-up sheet at Davis, Delaney and Harris, Inc., New York. Quality of printing has improved, delays are eliminated, and over 20 per cent of time is saved.

This company, printers of fine color catalogs and publications, previously used a localized lighting unit consisting of a bell-shaped dome with a 200-watt daylight lamp. The installation was considered "tops" at the time. In comparison with present equipment, the unit gave an uneven and confusing light distribution along the edges of the line-up table, particularly in the corners. Proof sheets had to be returned two or three times for checking, thus necessitating delays, conferences and much bending over and squinting.

In printing, line-up or proof sheets are used as a guide by the pressman before beginning make-ready on the press. Any changes made later, caused by incorrect line-up, are very costly. Measurements for margin and page position, and register of colors, must be checked accurately.

In exacting work of this nature hair-line precision is necessary. The employee who checks and approves line-up must be able to see clearly.

Here better lighting on the line-up table permits the stone-hand to stand up at his work, view the entire proof-sheet and, at a glance, detect variances.

Electric "Eyes" In Heat-Treating

Electric "eyes" are usually considered for the purpose of seeing but an installation has been reported where seeing is translated into feeling—to judge the temperature of steel parts being heat-treated. These "eyes" determine the temperature by the redness of the hot metal, gaging within 25 deg. F. of the precise temperature. Previous methods usually depend upon a measurement of the amount of heat applied to the metal.

Individual Motor Chimney

Tidewater Associated Oil Co. at its Avon, Cal., refinery has tried a new trick for cooling motors. A battery of 350 and 500 hp. motors, in a corrugated iron shed, drive centrifugal water pumps. They operate continuously and M. A. DeLew, Tidewater engineer, found that to use a standard rotor fan for a 500 hp. machine consumed 2 1/2 hp.

He ordered motors without fans, and cut an opening in the top of each case and erected a sheet steel chimney over each motor over this opening. He found that with this ventilation, the motors would operate at full load continuously without noticeable rise in temperature. These chimneys also have reduced the temperature in the shed.

On one 500 hp. motor, the energy



WITH BETTER LIGHTING the foreman checks the page line-up in a one-operation job. He stands up and does not need to squint when viewing the proof sheet of this Kaywoodie Pipe Dealers' catalog.



Outdoors, a safe distance away from the hazardous area of a Pennsylvania polymerization plant, is this "3C" Variable Speed Starter, installed in a special cabinet.

The enclosure is ventilated top and bottom with built-in grille work; the doors are gasketed; the top of the cabinet has a special hood or roof which successfully sheds water, thus making a weathertight job. It's more than a controller enclosure—it's a Control Room—entirely by itself in a *non-hazardous* area. The cabinet door must be opened to operate the equipment, but a locking device prevents tampering by unauthorized persons.

The "3C" control is for a 40 H. P., 220 V., 30 Phase, 60 Cycle Explosion Proof Variable Speed Wound Rotor Induction Motor, which drives a vertical triplex close-clearance pump having 1,100 pounds per sq. in. discharge pressure.

This "3C" installation, readily accessible to the operator, saved the additional cost of explosion proof apparatus and provides effective control and safety.

"3C" engineers will gladly consult with you on electrical control problems in hazardous or safe areas.

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 THE CLARK CONTROLLER CO. 	
1146 EAST 152 ND ST.	CLEVELAND, OHIO

The SIMPLE METHOD



MORE EARNINGS FOR BUSY CONTRACTORS

Neater jobs and no complicated installation troubles—that's why busy Contractors like the Briegel Simple Method. Just two squeezes on the handles of the BM Indenter and the BM Connector or Coupling is securely and safely fastened to the Electrical Metallic Tubing. More time for more jobs and, as a consequence, more earnings. Our tools and method are patented, therefore, we limit the use of our tools to the installation of our fittings only. See your Wholesaler or write our distributors for further details.

Listed by Underwriters' Laboratories

BRIEGEL METHOD TOOL CO.

Not Incorporated
GALVA, ILLINOIS



BM CONNECTORS AND COUPLINGS

**Cadmium
Finish**

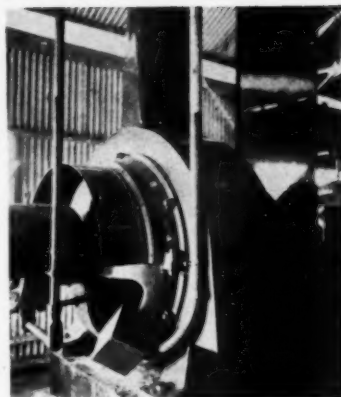


No. 405

B-M INDENTER

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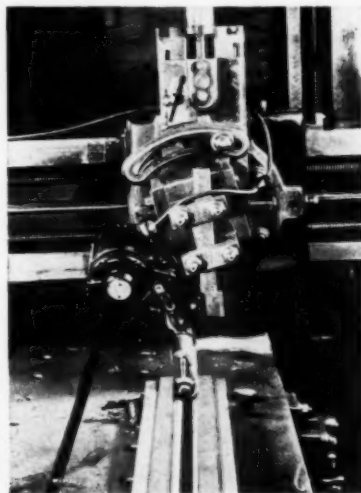
VENT CHIMNEY mounted on motor case reduces heating and increases efficiency at full load operation.

saving through a year figures 14,700 kw.-hr. under this cooling system. They are 2,200 volt, 3 phase synchronous machines and are giving efficiencies of 97.3 percent for 500 hp. motors and 96.6 percent for 350 hp. motors.

In the Interest Of Religion

A small motor-operated grinder was used in the production of a mold to form rubber tops for church pews. The application is unusual because of the necessity to maintain a true and even surface over the five-foot length of the mold. It was worked out in the tool and die shops of Nelson Bros. & Strom, Racine, Wis.

The set-up consisted of a Dumore No. 5 grinder with an extension quill, mounted in the tool-head of a planer. With this equipment, the job was done in a third of the time of a former hand scraper method.



TOOLED UP and grinding with a small motor-operated grinder.

Quick Service On Motor Bearings



Any quantity—any bearing. All makes of electric motors from 1/50 hp to 100 hp can be serviced with Bunting Bearings from stock. They fit. They last. Write for catalog . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

BUNTING

BRONZE BEARINGS
PRECISION BRONZE BARS



BEARINGS
HARDITT METALS



***"So that straight-line motion
makes your monkey jump up and down!"***

There is no need to "monkey" with Allen-Bradley solenoid starters after they are installed. One reason is the simple, frictionless, straight-line motion of the movable contact member. It has no bearings, pivots, or pins to cause trouble. Another reason is the long life, double break, cadmium silver alloy contacts, which give best service when left entirely alone. With generous wiring space, white interiors that illuminate the starter, accessible terminals, and many convenient knock-outs, these starters are easy to install. Use these rugged reliable Allen-Bradley solenoid starters throughout your plant. Enjoy the satisfaction of knowing that your control troubles are over.

Advantages of the A-B Straight-Line Motion

1. No troublesome bearings, pins, pivots, or complicated mechanisms.
2. No danger of accidental closing.
3. Gives equal contact pressure, which makes double break contacts reliable.
4. More compact switch mechanism.
5. No danger from contact rebound.
6. Increases arc rupturing capacity by allowing enclosure of contacts.
7. Utilizes solenoid magnet, with low drop-out and pick-up voltages.



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

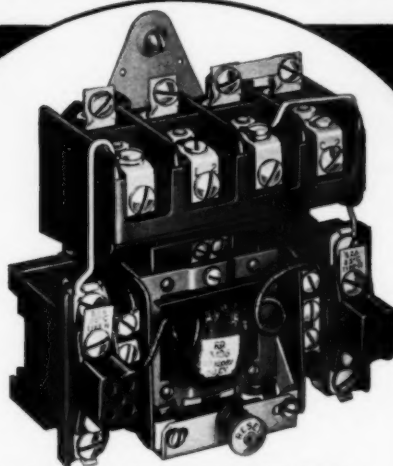
QUALITY

**CONTACT
TESTS
SHOW**

3 MILLION INTERRUPTIONS



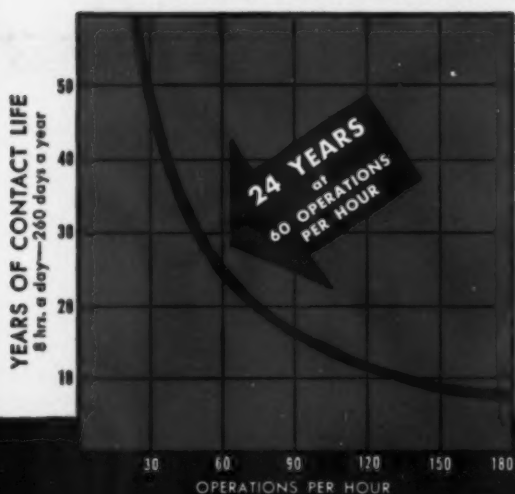
Testing an Allen-Bradley Bulletin 709 Solenoid Starting Switch to determine how many times it is capable of interrupting an overload. In this test, which is a particularly severe one, many years of starter life are condensed into a few weeks or months. Thus is starter stamina measured.



Mechanism of Size 1, Allen-Bradley Bulletin 709 Solenoid Starting Switch, tested at 150 amperes, inductive current, and 220 volts.

**—at SIX TIMES
RATED CAPACITY!**

What this means in Contact Life



Use this chart to determine how long the contacts on a Size 1, Allen-Bradley Solenoid Starter will last on your job with no maintenance or attention whatever.

Imagine, if you can, three million switch interruptions at six times rated load! That's the average life you can expect from the contacts in an Allen-Bradley Size 1 Solenoid Starter, as indicated by actual tests. It's equivalent to one operation a minute continuously, eight hours a day, for 24 years.

The secret of such unequalled performance lies in the contacts themselves and their vertical straight-line motion. These double break contacts, being made of a patented cadmium silver alloy, never need cleaning or filing, as do copper contacts. The cadmium in the contact metal helps to snuff out the arc. Each main contact unit is enclosed in its individual arc chamber, thereby increasing the capacity of the switch, without danger of flashovers. It is no wonder these Allen-Bradley contacts are free from trouble and are good for millions of operations with no maintenance whatever. Allen-Bradley Company, 1307 S. First Street, Milwaukee, Wis.



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL



In the News

NICHOLS AWARDED MCGRAW MEDAL

Louis M. Nichols, comptroller of the General Electric Supply Company received the James H. McGraw Award Wholesalers Medal at the convention of the National Electrical Wholesalers Association, in Cincinnati, Oct. 18. The presentation was made by Earl Whitehorne, speaking for the Committee of Awards. The citation read—

Louis M. Nichols, comptroller of the General Electric Supply Company, in Bridgeport Connecticut, for years has been a student of the cost of wholesale distribution of electrical products. He has advocated the use of precise cost knowledge in the control of both the sales activities and distributing operations of electrical wholesalers. Because of his wide experience and keen enthusiasm for research in this field, he was selected in May 1937 to act as chairman of a sub-committee, authorized to make a detailed national study of the operating costs of wholesaling, the full range of commodity lines sold by the members of the National Electrical Wholesalers Association.

Recognizing the vital value of such an analysis for the guidance of management and its possibilities in the readjustment of the sales objectives and warehousing methods of wholesale houses, as well as its implications for the manufacturers of electrical products, Mr. Nichols threw himself into the program with a zeal that won him the immediate support of the industry. He arranged for consolidating the operating figures of the three national wholesaling systems and accumulating comparable data from a large number of independent localized member companies, embracing the full scope of commodities, covering the months of July and August 1937. This data he compiled, analyzed and presented to the industry at the NEWA fall meeting in Cleveland in October of that year. Whereupon, that this knowledge might be digested and applied to improve the economics of the industry, he voluntarily assumed responsibility for the interpretation of this study for the guidance of the Association's Commodity Committees.

At great personal cost in time and energy, he has generously supported his completed committee responsibility with a continuing service that has embraced further commodity research, additional statistical compilation and analysis and uncounted conferences. In these contacts, his broad knowledge and his intelligent expositions of these inner facts of industry experience have increased the common understanding and brought benefit to all those who wholesale electrical products.



MEDALIST Louis Nichols receives congratulations from Earl Whitehorne after award presentation at National Electrical Wholesalers Association convention in Cincinnati.

In recognition of this outstanding contribution to the advancement of the Wholesaling Branch of the Electrical Industry, the judges have awarded to Mr. Nichols the Wholesalers Medal and Purse for 1939, given under the James H. McGraw Award.

The judges who selected Mr. Nichols for this award were—W. J. Drury, eastern district manager, Graybar Electric Co., N. Y.; L. F. Latham, vice-president, E. B.

Latham & Co., New York; C. McKew Parr, president, Parr Electric Co., Inc., Brooklyn, N. Y.; and Walter Williamson, vice-president, Westinghouse Electric Supply Co., New York.

EASTERN INSPECTORS AGAINST COVERED NEUTRAL

Inspectors of the Eastern Section IAEI at Providence, Oct. 2 to 5, voted against the article committee's recommendation to approve covered neutral conductor.

The inspectors voted for thin walled insulation, if it has the same electrical and mechanical properties as the present Code grade insulation. They also favored the adoption of the committee report on temperature limitations of conductors and the new current carrying capacity tables. Because of these new tables no action was taken on the modification of the conduit area rule.

The group concurred with the committee's non-approval of the other proposals advocated by the power companies, scheduled for action by the Electrical Committee NFPA at its coming meeting.

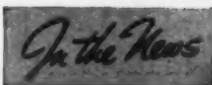
Dr. M. G. Lloyd, President, IAEI, in his address to the group said that Code making is a serious responsibility, and bargaining and compromise are out of place. Commercial interests should be heard but should not make decisions. He reported that the Legislative Committee is working on model ordinances affecting electrical inspection, electrical contractor licensing and sales control.

W. J. Donald, Managing Director of NEMA, talked on "Factors Affecting the Future of the Electrical Industry". He urged that cost be reduced by having fewer duplicating varieties of equipment. One national standard would be best, he said, with a free and open market for products meeting that standard.

Samuel Rosch gave an interesting and educational talk on "Synthetics—A New Development for Use in Modern Industry." Four Code sessions were devoted to reviewing article committee reports on Code revisions and additions.

NEW EXECUTIVES of Eastern Section IAEI: W. J. Canada, Chicago, executive committee (left); J. D. Lynett, N.Y.C., first vice president; R. B. Ward, Newark, N. J., executive committee; A. L. Holbrook, Winsted, Conn., retiring president; C. A. Berlepsch, New Haven, executive committee; J. Hagendorn, Hewlett, L. I., president; W. J. Mahan, New Haven, executive committee; J. S. Zebley, Washington, executive committee; C. A. Ward, Paterson, N. J., executive committee; and F. N. M. Squires, N.Y.C., secretary.





[FROM PAGE 87]

The new officers are—president, Joseph Hagendorn, Long Island; first vice president, James D. Lynett, New York; second vice president, T. V. Ward, Washington; treasurer, A. W. Hopkins, Springfield, Mass.; secretary, F. N. M. Squires, New York. Executive committee members are C. A. Berlepsch, W. J. Canada and R. B. Ward. Representatives to Executive Council are J. C. Forsyth, W. J. Mahan, J. D. Lynett. The section is represented on the Electrical Committee by W. J. Mahan and F. N. M. Squires as members and R. B. Ward and J. S. Zebley as alternates.

The Eastern Section conferred honorary membership upon A. W. Hopkins for his service in New England and as treasurer.

A-W CONFERENCE IN PITTSBURGH

More than 60 men attended the Middle Atlantic Regional Adequate Wiring Conference in Pittsburgh, Sept. 28 and 29. They came from nine states.

Discussions focussed around five major points—1. the need and market; 2. how local activities have been established; 3. general promotion; 4. development of individual prospects; and 5. employee training. A forum was conducted on each of these phases. Various national, local and Red Seal plans were discussed, also methods of securing the cooperation of contractors, wholesalers, dealers, inspectors, manufacturers, FHA and other groups.



"So that's where
Henry hides his
bottle!"

Much practical information was exchanged and many cities reported gratifying progress. In Washington builders now have the plans checked and additions of 15 to 20 outlets are common. Cincinnati is increasing plans 80 per cent on the original number of outlets. In West Penn Power nearly 1,100 houses have been certified. In Pittsburgh the Bell Telephone Company has tied into the A/W program with its campaign to place telephone circuits in raceways. Already in 90 per cent of the better homes contractors are providing conduit.

Harry Restofski, West Penn Power Company, and George A. Gardner, Duquesne Light Company, were co-chairman. Joseph McKinley, vice president of Duquesne Light Company, presided at a formal luncheon where Earl Whitehorne, Editor, *Electrical Contracting*, addressed the group. He declared that re-wiring is the electrical industry's biggest present job and urged the development of a demonstration technique to sell old homes.

LEAGUE MEN STUDY MARKET

The fourth annual conference of the International Association of Electrical Leagues was held in New York Oct. 4 to 6. More than 100 delegates and guests from 28 cities were present from 16 states. Ainslie Gray presided.

The session opened with a symposium on problems of the several branches of the electrical industry. C. W. Kellogg, president, Edison Electric Institute; Matthew Porosky, vice-president, NEMA; J. G. Johannesen, chairman, Executive Commit-



WIRING BOOSTER O. C. Small of the National Adequate Wiring Bureau and J. Walter Collins, secretary-manager of the Chicago Electrical Contractors Association, where both had contributed words of wisdom.

tee, National Electrical Wholesalers Association; and Earl N. Peak, president, NECA did the talking. One day was devoted to addresses on Selling Electric Ranges and Water Heaters by J. R. Poteat, General Electric Company; The Leagues' Problems in Selling Electric Refrigeration by C. R. D'Olive, Stewart-Warner Corp.; Developing the Washer and Ironer Market, by W. N. Gallagher, president, Automatic Washer Co.; Pathological Effects of Air Conditioning by Dr. A. G. Young, Corey Hill Hospital, Brookline, Mass. Major L. R. Lohr, president, National Broadcasting Co. revealed Today's Problems in Radio and Television Sales; F. R. Kohnstamm's paper was read by H. B. Donley of Westinghouse on Selling Traffic Appliances. D. W. Atwater, Westinghouse Electric and Mfg. Co., reviewed Lighting Progress, while A. B. Smedley, Anaconda Wire and Cable Co., discussed Adequate Wiring.

Round table discussions by league men filled another day. The market for the major domestic appliance and the promotion of air conditioning were discussed. The value of the Better Light-Better Sight and National Adequate Wiring Programs to the Contractor was also canvassed. League organization and management were covered in the final session.

Officers elected for the coming year are president, G. W. Weston, Kansas City; vice president, J. S. Bartlett, Washington; treasurer, Carl H. Christine, St. Louis; secretary, O. C. Small, New York.

The Board of Governors will include John Morrison, Philadelphia; E. P. Zackman, Cincinnati; E. J. Strong, Salt Lake City; G. W. Austen, Toronto; G. H. Nickerson, Pittsburgh; H. P. Wilson, Rock Island.

USE RADIO FOR A-W PROGRAM

Radio broadcasts from the yard and interior of projected new electrical homes in Denver will be a feature of an adequate



GIVE ME RACO•ALL-STEEL•PRODUCTS EVERY TIME —TO MEET MODERN WIRING REQUIREMENTS

There are good reasons why hundreds of successful men in the electrical and building industries standardize on RACO•ALL-STEEL•PRODUCTS. They know that by doing so they are protecting their own interests and are maintaining the good will of their customers. They recognize the importance of the nation-wide acceptance which these products have won from architects, contractors, builders and dealers. And they know that RACO•ALL-STEEL•PRODUCTS will meet the modern wiring requirements of their own localities efficiently and economically.

Competent engineering keeps RACO•ALL-

STEEL•PRODUCTS in step with all new developments and trends in wiring—numerous improvements have been developed which provide profitable advantages for both rural and urban modernization work as well as on new jobs.

There are more than 40 years of designing and manufacturing experience behind the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings carrying the famous RACO and ALL-STEEL trade-marks, assuring continued satisfaction and dependability. Write for a copy of the latest RACO•ALL-STEEL•PRODUCTS catalog—there is no obligation.

Distributed Nationally by

ALL-STEEL-EQUIP COMPANY, INCORPORATED

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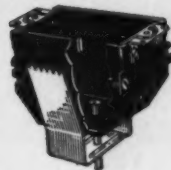


RACO • ALL-STEEL • PRODUCTS

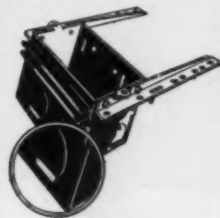
SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES
CABINETS • FUSE CABS • CONDUIT FITTINGS



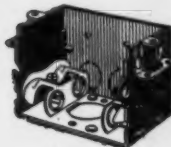
THESE PRODUCTS ARE
REPRESENTATIVE OF
THE COMPLETE
RACO•ALL-STEEL LINE



RACO • ALL-STEEL
OLD WORK SWITCH BOX
for mounting in a rewiring or
modernization job.



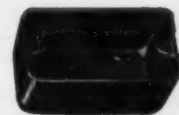
RACO • ALL-STEEL
"PRI-OUTS" for Clamp Boxes.
in both the Switch Box and
Outlet Box lines.



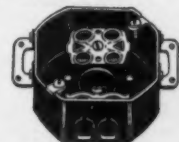
RACO • ALL-STEEL
SWITCH BOXES. The MC.
used in old or new work. The
Switch Box you need is in the
Raco • All-Steel Line.



RACO • ALL-STEEL
"HI-LO" BARRIERS for the
separation of differing voltages.



RACO • ALL-STEEL
UTILITY or HANDY BOXES
for surface wiring—old or new
work.



RACO • ALL-STEEL
EXTERNAL MOUNTING EARS
for Outlet Boxes. Several types
of Raco • All-Steel Octagon
Boxes are furnished with
External Mounting Ears on special
order.

Ask For
GENERAL ELECTRIC
CORDX
ALL-RUBBER
CORD

"CORDX All-rubber Cord" is the new name given by General Electric to its 60% Type S All-rubber Cord.

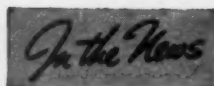


HOW G-E CORDX IS MADE:

1. Extra-flexible multi-strand copper conductors — provide maximum flexibility.
2. Closed cotton wrap — prevents corrosion between copper and insulation.
3. 30% performance insulation — provides high dielectric strength and long life.
4. Soft twine fillers — form cushion for conductors and increase cord's tensile strength.
5. Open twine braid embedded in rubber — prevents splitting of jacket.
6. 60% pure rubber jacket compound — protects against abrasion, surface oils, acids and water.

This method of manufacture makes G-E CordX All-rubber Cord practically indestructible. For further information see the nearest G-E Merchandise Distributor or write to Section W-9411, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC



[FROM PAGE 88]

wiring publicity program. It is being developed by an electrical group headed by Ralph E. Johnson, Denver contractor, and tied into the Rocky Mountain Electrical League. Newspaper advertising, posters, pamphlets and industry group meetings will spread the story to every locality in these states.



AFTER DINNER—In a row at the I.A.E.I. Eastern Section banquet were J. D. Lynett, N. Y. (left), Victor Tonsley, Chicago and J. W. Hager and A. R. Mack both of N. Y.

COMING MEETINGS

American Institute of Electrical Engineers—Winter convention, New York, Jan. 22-26.

American Society of Heating and Ventilating Engineers—Annual meeting and International Heating and Ventilating Exposition, Lakeside Hall, Cleveland, Ohio, Jan. 22-26.

National Electrical Manufacturers Association—Mid-Winter Conference, Waldorf-Astoria Hotel, New York, Feb. 5-9.

Minnesota Electrical Trade Exposition and Convention Week—St. Paul Hotel, St. Paul, Minn., Feb. 12-15.

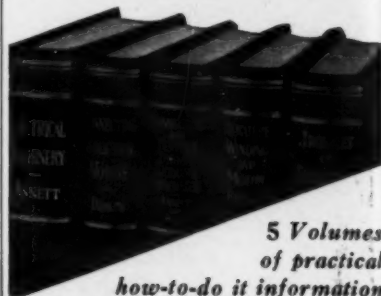
MICHIGAN INSPECTION BUREAU FORMED

Michigan inspectors have just formed the Michigan Electrical Inspectors Bureau. The purpose is to preserve organized inspection facilities until new state legislation can be passed to replace the former Michigan State Electrical Law, recently declared unconstitutional.

Officers of the new bureau elected on September 20 are—

H. L. Haight, Owosso, President
Carl Wilson, Pontiac, Vice-president
Lloyd Branch, Lansing, Secretary-treasurer

Every phase of electrical maintenance and repair work covered in this NEW Library



5 Volumes
of practical
how-to-do it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with hand-book information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

- install all types of motor and generator units;
- locate breaks in armature windings and do a workmanlike job of rewinding;
- know just what is wrong with an electrical machine and take charge of installation and maintenance work;
- making accurate tests of switchboards and apparatus and correctly balance the power with the load;
- handle every sort of wiring job;
- show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

New trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you \$1.00 in 10 days, and \$2.00 a month until \$15.00 has been paid. Otherwise I will return the books postpaid.

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City and State

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Position

(Books sent on approval in U. S. and Canada only.)

Carl D. Mason, Mount Pleasant, Director
L. E. Felt, Baldwin, Director

All rural electrification cooperatives and three major utilities in the state, previously served by the state inspectors, require electrical inspection on all wiring jobs before service connections can be made. The bureau will provide inspection facilities to these projects and to individual contractors who sell inspection with their jobs.



CHICAGO VISITORS—A. H. Kessler, promotion manager of the North Central Associated Electrical Industries of Minneapolis and H. P. Wilson, Manager of the Electrical Institute of the Tri-Cities of Rock Island, Illinois, admire the view from the 38th story offices of the Chicago Electrical Association during recess from the Adequate Wiring Conference.

ELECTRICAL COMMITTEE DATE CHANGED

Due to uncertainty of the date of Thanksgiving, the meeting of the Electrical Committee will not be held Nov. 19 as planned. A tentative date is set for December 4 to December 8, at Haddon Hall in Atlantic City.

But the members are asked to reserve the week of November 20 also. An important part of the proceedings will be a discussion of the proposed changes to the National Electrical Code.

WIRING FOR COMMERCIAL COOKING

The Commercial Electric Cooking Council has just published its "Survey of Sales of Commercial Electric Cooking Equipment for 1938." This survey was compiled from the replies of 128 power companies, making it the most comprehensive report so far produced. It covers only commercial establishments and does not include municipal customers nor utilities.

This report shows that 125 of the 128 companies reporting sold 65,101 kilowatts of commercial electric cooking equipment in 1938 as compared to 63,467 kilowatts sold by 103 companies in 1937. To offset the installation cost of the equipment, 43.3 per cent of the companies reporting in 1938 made "wiring-in" allowances. In

HERE is a MONEY SAVER and a STEP SAVER

NO. 301
Listed by Underwriters' Laboratories

The No. 301 three-way canopy pull Switch is designed to save steps and money by controlling one or more lights from two different points. Principal installations for three-way switches are in hallways where the light may be turned off or on at the entrance or exit and in garages and houses where the lights may be controlled from either point. In long halls where two lights are used, they may be turned off at either end.



No. 201
The No. 201 is a two-circuit canopy pull switch designed to control double filament lamps.

MCGILL MANUFACTURING COMPANY
Box 670 • VALPARAISO, INDIANA

FLOOR BOXES AND WIRING SPECIALTIES

No. 330 "Latrobe" Tom Thumb Utility Outlet

For use in wood installations, and other locations free from moisture or mechanical injury.

No. 285 Double Duplex Receptacle Nozzle

The most attractive, compact and easy-to-install fitting on the market. Shown in illustration with No. 200 Cover Plate.

No. 110 "Latrobe" Watertight Box

Cut-away view showing how tapered unit receptacle fits tapered opening in top box body. The last word in design, appearance, and simplicity of installation.

The Latrobe Line is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time... an important point to consider when selecting floor boxes and wiring specialties

FULLMAN MFG. CO.
LATROBE • PENNA.



Matching the amazing development and progress of the building and electrical industries for over a quarter century, the Paine Company has been foremost in developing and improving metal specialties for those fields.

PAINE CABLE CLAMPS

For use on cross arms, overhead beams, etc., the Paine Cable Clamp is easiest to install . . . merely slip the bolt with nut already on into the patented slot and tighten. Does away with the old 3-handed method. Clamp is hot-dip galvanized for rust resistance.

PAINE Hanger Iron

8 sizes, all lengths, in rolls or long lengths. A uniform, well finished perforated hanger iron in either black or galvanized stock.

In Coils or Lengths



Fig. 500A

PAINE ONE AND TWO HOLE ROMEX STRAPS



No. 201-1 Hole

No. 201-2 Hole

For use in supporting sheathed cable. Has the prominent center bead or rib that adds extra strength to the strap. Fits cable snugly, giving maximum support.

PAINE BX Staples

Ideal for use in supporting BX Cable running along side walls. Conforms accurately to shape of BX, fits the cable exactly, allowing no play or movement that would loosen installation.



PAINE Pipe Straps



Prominent bead or center rib adds extra strength to the Paine strap. Uniform gauge materials, accurately punched holes . . . entire strap free from burrs and sharp ends . . . make this the preferred pipe strap. Strap fits pipe closely, eliminating play and movement.

THE PAINE COMPANY

2961 Carroll Ave. Chicago, Ill.
New York Warehouse & Sales
48 Warren St.
Carried by all leading jobbers

In the News

[FROM PAGE 91]

1937 only 37 per cent of the reporting companies did this. This allowance varies from \$3.50 to \$6.00 per kw., with an upper limit of \$250 in some cases. Of these reporting companies 85 planned more active sales campaigns in 1939 while 18 companies planned to continue as in 1938.

No figure is developed as to the volume of wiring business involved in this total load, nor the number of units that were installed. But it bulks large enough to merit the attention of contractors in locations where the commercial cooking load is being developed.

NEW YORK CONTRACTORS HEAR A-W STORY

The Adequate Wiring Campaign is gaining momentum in New York City. At a meeting of the New York electrical contractors on October 18, Arthur E. Schanuel, field representative, National Adequate Wiring Bureau, presented his poster story of Adequate Wiring Promotion. Henry J. Morton, Detroit Edison Company, with the aid of slides, presented a detailed picture of the "Geometry of Raceways" and thin walled insulated wire, with its possibilities in rewiring existing buildings. William Crawford, vice-president, Commercial Credit Corp., explained the financial support that the FHA program could give adequate wiring and the advantages of installment selling to the electrical contractor.

KITCHEN ADEQUACY FOR HUDSON VALLEY

Lacking new home construction, members of the Hudson Valley Electrical League turned their attention to the existing home for more business. They organized "The Kitchen Adequacy Circuit Activity" with the cooperation of the Central Hudson Gas and Electric Corporation.

Four league contractors Charles G. Harring, Cairo; Chester Miller, Kingston; Edgar A. Popper, Wappingers Falls; George Parlman, Wallkill and Messers Dexter, Waterman and Lasher of the utility comprised the committee that drew up the plans. The campaign offers modern adequate wiring in a simplified, inexpensive, easy-to-take form with an eight months' financing plan to reach modest household budgets. The kitchen circuit has two No. 10 wires with a type MO multi-breaker, two duplex convenience outlets or a three-foot section of outlet strip with six outlets. The customer's cost ranges from \$12 to \$17 with down payments of \$3 to \$5 and the monthly payments added to the electric bill.

SEE FOR YOURSELF

How wires are wedged fast—gripped *completely around* in the V-BOTTOM wire opening of



SOLDERLESS LUGS

Learn how fast you can make strong, neat solderless connections . . . with just your wrench, screw driver or pliers.

SEE ONE IN ACTION!

Write for Free sample—or better still, ask your Electrical Jobber for one.

DEPT. E C

IlSCO Copper Tube & Products, Inc.
5629 Madison Road, Cincinnati, Ohio

With Only One Screw
to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker
Easier Installation

"CONVINCE YOURSELF"

"Send for Circular
Giving Full Details"

THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

FIVE "IDEAL" MONEY MAKERS

1. Wire Nuts

"Solderless — tapeless Wire Connectors." Skin wires — Screw On — That's All! One size for all common wiring joints. Fully Approved — Listed by Underwriters' Laboratories, Inc. MILLIONS IN USE!

2. "E-Z" Wire Strippers

Strip the toughest insulation without nicking or cutting strands. Models and sizes for stripping solid or stranded wires from No. 30 gauge to No. 5.

3. Cable Ripper

For ripping non-metallic sheathed duplex cable or lead covered cable. Cuts cleanly—easily—quickly.

4. Joist Boring Machine

Ends tiresome and dangerous reaching. Bore holes at any angle—reaches to 11 ft. height above floor, bores beneath floor.

5. Fish Tape, Reel & Puller

NOW fishing IS a pleasure! You get three tools in one—Fish Tape, Reel and Puller. Keeps tape reeled up—no expensive tape breakage—no "live" contacts. NEW! "Junior No. 0" — Price \$2.50. Easily fits in tool kit.

SOLD THROUGH JOBBERS

Electrical Products Division
Ideal Commutator Dresser Company
1041 PARK AVENUE SYCAMORE, ILLINOIS



Units that show merchandise in the proper light! Attract attention. Increase Sales Appeal. Give more sales power per dollar operating cost. Sterling Lite-Flo Reflectors light show windows with highest efficiency — give more sales value with same operating cost. STERLING Lite Louver-Controlled Direct-Lighting Units revolutionize Interior Store Lighting.



Send data for modern store lighting layout or write for catalog.

STERLING REFLECTOR CO.
1435 West Hubbard Street, CHICAGO

MORE REA MONEY

Uncle Sam has just given out \$131,000 more to pay for the wiring and plumbing of rural homes in 18 states. The money is appropriated in \$5,000 to \$15,000 lots to be loaned by local cooperatives to members needing assistance in getting ready to use electricity for pumping water and other domestic purposes.

BOOK REVIEWS

Conduit Bending Manual

A book of practical instructions for bending large size electrical conduit with a hydraulic or screw jack bender. It is written in plain language. The methods described were developed by the writers from experience over a period of years in the electrical construction trade.

Designed to be a text for self instruction, as well as a handy reference, its contents cover a description of the bending machine parts; how to bend an elbow, or two 90 degree elbows on one length of conduit, or concentric elbows and bends less than 90 degrees; how to make offsets, parallel offsets and offsets of a known angle; how to make a group of bends having the same radius, or saddle bends or bends of unknown radii for tunnel ceilings and large tanks. Twenty-three diagrams illustrate the instructions and five tables give data covering width of bending spaces, values for bends less than 90 degrees, conduit spacing between centers, also conduit sizes, diameters and weights, and a table of decimal equivalents.

Conduit Bending Manual by Albert M. Kruger and Trafford J. Ferry. Price \$1.50. Forty-nine 5 1/2 in. by 7 1/2 in. pages in flexible paper binding. Published by the Conduit Bending Manual Publications, 6555 77th Place, Maspeth, N. Y.

"Industrial Electricity"

This book, a revision of the 1924 edition, is devoted to the fundamentals of electrical engineering and its industrial application. It embraces all the latest developments in machinery, storage batteries, instruments and magnets.

Chapter discussions cover in simple language—resistance; the electric circuit; primary, secondary and storage batteries; electrical instruments, and testing; electro-magnetism; electrostatics, capacitance; generators, and motors; automobile starting and lighting systems; mathematical tables and problems on all chapters.

A fine text book for the student and reference book for the practical man. Industrial Electricity, Part I, by Chester L. Dawes, S. B. Price \$2.20. 380 pages, including 322 problems, numerous charts and diagrams. Cloth bound. McGraw-Hill Book Co., 330 W. 42nd St., New York City.

WITH THE
Manufacturers

Graybar Appointments

The Board of Directors of Graybar Electric Company recently elected E. A. Hawkins a vice-president. Mr. Hawkins has been with the company since 1899.

Graybar has appointed Alfred H. Nicoll as assistant to President Frank A. Ketcham, with headquarters in New York. Mr. Nicoll was formerly San Francisco District Manager.

Mr. Nicoll is succeeded at San Francisco by J. P. Carson, who has been sales manager at Los Angeles.

W. E. Guy, manager of Graybar at Hammond, has been transferred to Los Angeles to take Mr. Carson's place as sales manager.

PORCELAIN PRODUCTS PORCELAIN OUTLETS



**Cut wiring costs,
increase
PROFITS**

Learn how contractors everywhere are cutting wiring costs through the use of Porcelain Products' Porcelain Outlets, how savings and profits are being effected through their use. Get the facts—then quote your next wiring job on the basis of supplying Porcelain Products' Porcelain Outlets. Your customer will be pleased with the job—you will have the satisfaction of having installed a safe, durable wiring job at low cost to the customer and will have earned a neat profit for yourself.

Write for full details

PORCELAIN PRODUCTS, INC.

FINDLAY, OHIO

NEWS ABOUT THE PLAN BEHIND



a new
Profit Source
for the
contractor

Everywhere electrical contractors are joining the Clarion Institute of Sound Engineers. For here is a new and logical way for the contractor to increase profit, backed by a plan — the C.I.S.E. Plan — that means profit assured on every Public Address installation. As an authorized Clarion Sound representative, the C.I.S.E. Plan gives you all these sales advantages —



1. Direct from Factory Purchasing — means a wider margin of profit.

2. Exclusive Sales Representation — means freedom from competition in your particular territory.



3. Manufacturer's whole-hearted cooperation — means the experience, production and laboratory facilities of Clarion are at your disposal at all times.

4. Sales promotion to back you — means advertising in leading industrial and general trade papers, direct mail, window streamers, catalogs and booklets.



5. Prospects uncovered for you — means "leads" in your territory received by Clarion are turned over to you, making it easy to close the sale.

You must act quickly

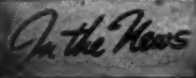
C.I.S.E. membership is granted to one contractor only in a territory. Many will see this ad. The coupon below is your application for membership. It brings full details about Clarion — the Quality line of Sound Equipment, and this sensational profit plan. Mail the coupon now. Find out how easy it is to install "packaged" Clarion P.A. Learn more about this big profit-opportunity that's made to order for you. Act at once!

CLARION INSTITUTE OF SOUND ENGINEERS

69 Wooster Street New York

Clarion Institute of Sound Engineers
69 Wooster St., New York City 21-1139
Please send us immediately complete information concerning the C.I.S.E. money-making plan, together with my application form. I understand that this obligates us in no way whatever.

Name.....
Address.....
City..... State.....



[FROM PAGE 93]

G-E Personnel Changes

F. A. Faron, manager of the New Haven office, of the General Electric Co. and E. G. Dudley of the industrial department, New York District, have been named assistant managers of the industrial department of the New York District.

C. E. H. Palmer, of the G-E Newark office, has been appointed manager of the New Haven office.

Goodrich Electric Co. Chicago, has appointed Harry Q. Beven sales representative in Wisconsin, with headquarters at 1012 N. 3d Street, Milwaukee. He was formerly with Crouse-Hinds Co.

R. C. Purdy, who was formerly connected with Turrell and Benfield, Detroit, has formed the Purdy Electric Sales Co. He will represent the Goodrich Electric Co. in Northern Ohio territory, with headquarters at 1900 Euclid Ave., Cleveland.

R. E. Uptegraff Manufacturing Co., Scottsdale, Pa., has appointed J. G. Green sales representative, with offices in the Oliver Building, Pittsburgh, Pa.

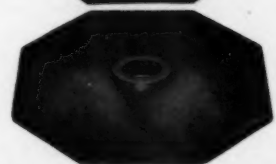
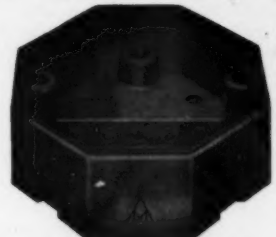
T. B. Wood's Sons Company of Chambersburg, Pa., has appointed the following distributors—M. L. Erlenmeyer, Elmira, New York; Boyer-Campbell Company, Detroit; and Berger Bros. Electric Motors, Inc., Rochester, N. Y.

Ransome Concrete Machinery Co., Dunellen, N. J., has announced the appointment of the Fuchs Machinery & Supply Co., 1102 Farnam St., Omaha, Neb. to handle their products in part of Nebraska and Iowa.

Cutler-Hammer, Inc., Milwaukee, has appointed H. E. Ankeney to take charge of its Indianapolis territory, with headquarters at 307 N. Pennsylvania Ave., Indianapolis. In recent years Mr. Ankeney has been associated with the Chicago office.

On October 1, 1939, the New Orleans sales office and warehouse of Cutler-Hammer, Inc. moved to new quarters at 732 Girod St., New Orleans, La.

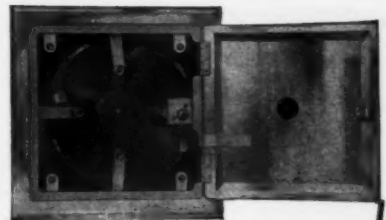
Profit by USING **ILLINOIS** Dependable Porcelain **OUTLET BOXES**



*Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.



AUTOMATIC WALL BOX *Kitchen Vent Fan*

- 10" Quiet Type Blades
- Totally Enclosed Motor
- Automatic, Weather-tight Shutters
- Telescopic Design for walls 7" to 24"
- Easy to Install
- Door Operated Switch
- Air Displacement 615 C.F.M. in free air
- List Price \$24.00 for 7" to 13" size
Slightly higher for 13" to 24" size

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan, U. S. A.
Offices in all principal cities

SIGNAL

More Gossip

N. J. Association Elects Officers

Joseph Buhl, of Buhl and Caffrey electrical contractors of Newark, N. J., was elected president of the Electrical Contractors Association of New Jersey at a recent meeting of the organization. Other officers are vice-president, A. Meister of A. M. Meister and Co., Newark; treasurer, Jacob Friedman of Friedman Brothers Co., Newark and secretary, H. H. Ramhurst of the H. H. Ramhurst Co., South Orange, N. J.



EXECUTIVE C. W. Nunn, Swanson-Nunn Electric Co., Evansville, Ind. believes that the best road to profit is adequate plant facilities plus modern methods. Always on the lookout for new ideas the Swanson-Nunn organization is one of the outstanding electrical institutions in the Middlewest, operating in the electrical construction, motor sales and repair, and electric sign field.

Canadian Engineer Steps Out

R. Harold Williams, former supervising engineer of the Hume & Rumble Ltd., large electrical contractors of western Canada, has organized his own contracting and engineering firm to operate as R. H. Williams Co., Ltd., Vancouver, B. C.

Record Job

S. C. Ruckman of the Union Electric Co., electrical contractors of Knoxville, Tenn. is looking forward to busy days for the next few months. He just took over the electrical contract for the largest construction job in the history of Knoxville, a Federal Housing Project.

Electrical League School

The Essex Electrical League, member of the New Jersey Council of Electrical Leagues, is conducting an air-conditioning and refrigeration school for the members of its maintenance division. David McLenegan, General Electric Company engineer, is the instructor. The course consists of six lectures. A class of 132 "students" gathered for the opening lecture in Newark on September 19.



Long Beam Floodlight



Glassteel Diffuser



RLM Standard Dome



Duplex Dome Reflector

QUAD

LIGHTING UNITS...

- A Complete Line
- Types for Every Indoor and Outdoor Installation
- Modern in Every Detail
- Strong, Weatherproof Construction
- Permanent Porcelain Enamel Finish
- Easily Installed
- Quickly Detachable for Cleaning
- High Lighting Efficiency
- Contractors Can Depend on Quad Units to Build Business Because They Satisfy Customers
- Get Acquainted—Put Quad Units to Work for You

QUADRANGLE MFG. CO.
32 S. PEORIA ST. CHICAGO, ILL.

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EASTERN COMMERCIAL TRAVELERS

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ACCIDENT POLICY PAYS
ACCIDENTAL DEATH
\$5,000-
\$10,000
Estimated Annual Cost \$15.00

WEEKLY DISABILITY
\$25.00-
\$50.00

HEALTH POLICY PAYS
\$25.00 Per Week for Confining Sickness
\$10.00 Per Week for Non-confining Sickness
Estimated Annual Cost \$18.00



PAYS WHILE YOU ARE LAID UP
PAYS FROM THE FIRST DAY OF DISABILITY
45 YEARS OF UNFAILING SERVICE

No Policy Is Cancelled, Rates Increased, or Benefits Reduced on Account of Age!

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Eastern Commercial Travelers
80 Federal St., Boston

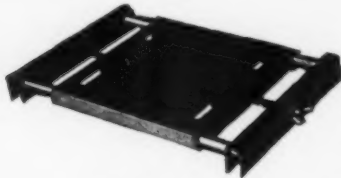
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Address
City State
E-C-39

EQUIPMENT *News*

Motor Base

This new motor base called "Automatic" is suited to short center drives. It automatically maintains correct belt tension through action of steel springs. Covers horizontal, vertical or overhead drives. Operates with pulsating, steady or reversing load. Made of steel. Motor is mounted on sliding plate of base. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.



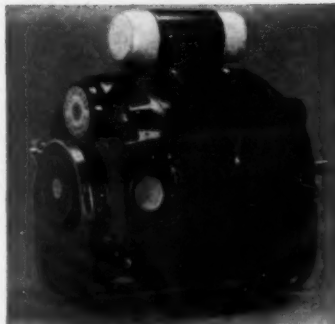
IDEAL MOTOR BASE

Transformer

A new line of air cooled power transformers have been developed. Three separate models cover all standard voltage characteristics from $\frac{1}{4}$ to 10 kva., in auto and insulated types. Some of the features are full air draft external ventilation; specially wound, hand finished coils, between layers with high dielectric strength insulation. Adapted for industrial application, where oil-cooled transformers may effect fire risk. Acme Electric & Mfg. Co., Cleveland, Ohio.



ACME AIR-COOLED TRANSFORMER



WESTINGHOUSE THERMOGUARD STOKER MOTORS

Stoker Motors

The new Thermoguard stoker motor makes possible stoker drives self-protected against any operating condition except fire and flood. It takes the motor off the line before it can be damaged by continuous overload, clogging of stoker feed, inability to start because of low voltage, inability to run because of low voltage, excessive temperatures, failure of ventilation. As soon as it is safe, Thermoguard puts the motor back on line. Motors can be totally enclosed to prevent coal dust from entering motor housing and clogging switch mechanism or otherwise interfering with operation. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



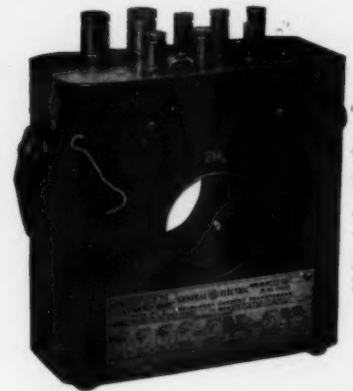
BURNDY COPPER BRAID

Copper Braid

These flexible copper braid jumpers are suitable for carrying instantaneous currents up to 30,000 amperes. Inner ends of copper ferrules are belled to prevent excessive stress concentration in strands as they leave ferrules. Curved or straight braid assemblies with ends compressed into solid mass in ferrules have been made for any ampere capacity desired. Burndy Engineering Co., Inc., 459 East 133d Street, New York.

Transformer

This portable current transformer, JP-1, is designed for field testing, a lightweight, multi-range device with suitable accuracy. Combines wound-primary and through-primary construction, and a tap in secondary is used to obtain additional ratios. Has a core window 2½ inches in diameter. Primary ratings of 10, 20, 50, and 100 amperes are obtained from wound primary with terminals on top of case. Passing primary cable through core window once obtains ratings of 600, 800 amperes; passing it through two or more times obtains ratings of 150, 200, 300, 400 amperes. Transformer's secondary rating is five amperes. General Electric Co., Schenectady, N. Y.



G.E. CURRENT TRANSFORMER

Multi-Breaker

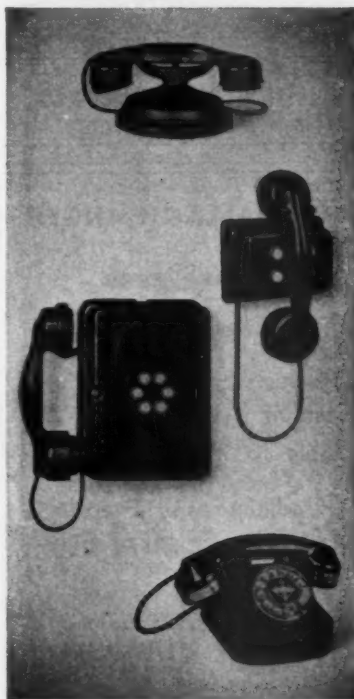
The new Trumbull Type "MO" multi-breakers are supplied in 15, 20 and 25 amp. capacities. Give low-priced short circuit and overload protection to motor, lighting and high wattage appliance circuits. Can be used in factories and on farms. Also in cottages, apartments, farm buildings, where no more than one double pole or two single pole circuits are required. Furnished for flush or surface mounting. Provided with insulated, grounded or no neutral. Trumbull Electric Mfg. Co., Plainville, Conn.



TRUMBULL MULTI-BREAKER

EVERY **20** MINUTES

Someone Buys A
**PRIVATE INTERIOR
TELEPHONE SYSTEM**



SERV-U-FONES

Low priced, all metal telephones, in common talking systems of two to ten stations. Conveniently packaged, simple to install.

IDEALFONES

Compact, wall type telephones, with molded plastic handsets. Available with one or five buttons for common talking service up to ten stations.

INTERCOMS

Use same handset as Ideal-fones, but available in both desk and wall styles. Common talking systems of two to eleven stations.

P-A-X's

Private automatic exchange systems providing dial service and secret connections. Available in any capacity from ten stations up, with telephones in a wide variety of types.

On an average of three times every hour of a typical business day, a private interior telephone system is installed in somebody's office, home or shop.

To get your share of this profitable business, all you need do is to acquaint your customers and prospects with the time-saving and step-saving advantages of Automatic Electric interior telephones. Let them actually see and use these modern, efficient instruments.

Automatic Electric, originators of the automatic telephone, have been making both public and private systems for fifty years. Shown here are four of the many types of private systems available. Our local representative will be pleased to supply you with literature, prices and discounts as well as to work with you on particular jobs. A call will bring him promptly.

[Automatic Electric Intercommunicating Systems are designed for private service. They cannot be connected with the public telephone system.]



PRIVATE INTERIOR TELEPHONE SYSTEMS


Distributed by: **AMERICAN AUTOMATIC ELECTRIC SALES COMPANY**, 1033 West Van Buren Street, Chicago, Illinois

Sales and Service Offices in Principal Cities

In Canada: Canadian Telephones & Supplies, Limited, Toronto

Electrical Contracting, November 1939

GENERAL ELECTRIC
Announces



**A New Line of
STANDARD
SWITCHES**
(with Textolite boxes)

Available in single-pole, double-pole, 3-way and 4-way types — all with "T" rating for Type C loads.

These new switches are outstanding in design and performance. Everything about them is new except their catalog numbers. They are listed by the familiar numbers of the old G-E standard porcelain box line which has been discontinued.

LOOK AT THESE FEATURES

1. **BLADES ARE SECURELY ANCHORED** IN TEXTOLITE BLADE CARRIERS giving high dielectric strength and permanent alignment. Construction is simplified. Fewer parts provide longer life.
2. **CONTACTS ARE DEFINITELY POSITIONED** by the Textolite box. Dust cover, assembled under the support, stays in place.
3. **LARGE BINDING SCREWS** for top wiring accommodate No. 12 wire.
4. **COMPRESSION TYPE SPRING** increases strength and durability.
5. **WIDE MOUNTING EARS** provide correct and easy installations. These ears are washer type and can be broken off to form washers for building up switch when necessary.

All of the switches in this new line are neat in appearance, light in weight, and highly resistant to breakage. For further information see the nearest G-E Merchandise Distributor or write to Section D-9411, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

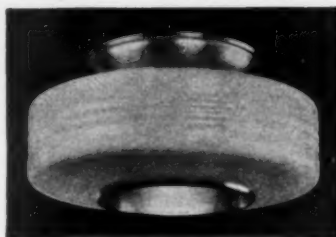
GENERAL ELECTRIC



[FROM PAGE 103]

Lighting Unit

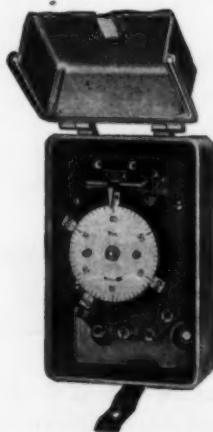
The "Director" lighting fixture has been developed for small and large stores. It consists of a glass bowl in an aluminum reflector. An adaptor fitting makes it possible to use this bowl with any hanger or fitter of the 6-inch type. Takes 200- or 300-watt lamps and has medium screw base. Available in pendant and ceiling type. Curtis Lighting, 1123 West Jackson Blvd., Chicago, Ill.



CURTIS DIRECTOR UNIT

Timer

Type C. T. Cycle timer has been designed for use on a.c. circuits. It continuously closes and opens a single circuit at any preset operating interval or alternately closes and opens two circuits. Some of the features are—a variety of time ranges; four operating arms; ready adjustment; switch mechanism has a definite snap action with positive lock in both operating positions. Timer is in a housing for surface mounting and is both moisture and dust proof. Has a glass window for inspection purposes, hasp for padlocking and four knockouts for either 3/4-in. or 1/2-in. conduit connection. R. W. Cramer Company, Inc., Centerbrook, Conn.



CRAMER TIMER

MULTI REFLECTORS . . .



SILVER BOTTOM LAMP

Constructed to give ventilation because these lamps run hotter than the standard Mazda. Top opening permits a portion of light to escape to ceiling.



2-PIECE DOME REFLECTOR

Has white diffusing glass globe with oil white reflector. Globe is held by a MULTI "Gripit" holder with internal finger support. No breakage from vibration or expansion.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th St., CHICAGO, ILL.

MINERALLAC HANGER



Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP



Sizes from .250" O.D. Tubing
to 1 1/4" conduit.

See your Jobber

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MINERALLAC ELECTRIC CO.
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INDUSTRIAL PLANTS KNOW VALUE OF LIGHTWEIGHT, CORROSION-RESISTANT

Alcoa Aluminum Bus Bars



Flat Alcoa Aluminum Bus Bars supply current for metal-finishing processes in these industrial plants.



Bus bars are frequently subjected to attack by corrosive gases generated in industrial processes. That's why Alcoa Aluminum bus bars are so widely used to serve these processes. Aluminum performs well under adverse conditions.

The light weight of Aluminum bus bar is an equally important advantage; buses must often be installed where no provision was made for supporting heavier materials. Aluminum provides ample current-carrying capacity and strength to withstand short-circuit stresses.

Ask our engineers for recommendations and a quotation on your next bus bar installation. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.



Aluminum housings are non-magnetic, light in weight, strong and neat. Need no protective coating of paint. Aluminum is easy to fabricate; sheet and structural shapes may be purchased from conveniently located stocks.



ALCOA · ALUMINUM

PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manually); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only \$35.

TIME SWITCHES

TRIPLE POLE
DOUBLE POLE
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from \$16.50 up. Ten ampere Time Switches from \$3.95 up.

Write for Information

AUTOMATIC ELECTRIC MFG. CO.

MANKATO, MINNESOTA

HOW TO BEND LARGE CONDUIT



The Book
every pipe man
wants!
**AVAILABLE!
NOW!**

CONDUIT BENDING MANUAL

Every contractor, job foreman, plant electrician and pipeworker can use the full information given in the Conduit Bending Manual on "bending big pipe" on hydraulic and screw jack machines.

50 pages crammed with facts, useful tables and diagrams and explanatory sketches. Handy pocket size.

Takes guesswork out of conduit bending. Prevents delays, saves wasted material.

Prepared by veteran big-pipe men from their daily on-the-job experience.

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Send _____ copies of your \$0 page "Conduit Bending Manual" (Single copies, \$1.50 each; 5 to 10 copies, \$1.25 each; we pay postage on orders paid in advance.)

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[FROM PAGE 97]

Reflectors for Mercury Lamps

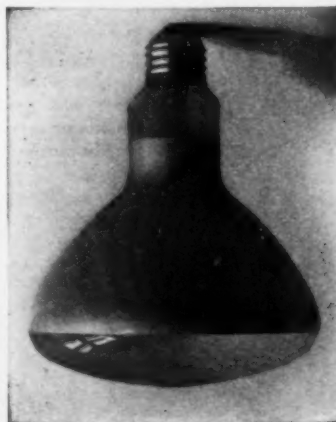
The H-4 100-watt mercury lamp comes with three different types of glass bulb. Type T-10 bulb has clear glass, T-16 has glass of a red-purple color and Type S-4 has A-21 pyrex glass bulb and transmits both ultra-violet and visible light. These reflectors may be used with pendant and angle R type and pendant B-Heel type. Socket covers of R type are ventilated and sockets are tapped standard for 1/2-in. conduit. B-Heel type can be used with snap-lock and separable holders for attaching directly to socket. Transformers are available for 50 to 60 cycle operation. The Miller Co., Meriden, Conn.



MILLER REFLECTORS

Floodlight Lamp

A new 300-watt mazda reflector floodlight lamp has been developed for interior floodlighting purposes and for supplementary industrial and commercial lighting. Over-all length is 6 1/2-inches. Unit is 5 inches in dia., using R-40 bulb. Lamp may be burned in any position on 110-, 115- and 120-volt circuits. Has a medium screw base and should be used only with porcelain sockets. Westinghouse Electric & Mfg. Co., Cleveland, Ohio.



WESTINGHOUSE FLOODLIGHT LAMP

ANNOUNCING the NEW REFLECTO "FLUOR-DUCT BOXES" for Fluorescent Lighting



Copyright and Patent Pending

- **EASY TO WIRE**
Requires no Labor or Tools
- **FINISHED APPEARANCE**
Bright Cadmium Plated
- **RUGGED, STRONG**
Made of Steel—Rust-proof
- **EASY TO EXAMINE**
Easily Accessible to inspect electrical work
- **UNDERWRITER'S LABORATORIES, INC. INSPECTED**
- **HIGH SALES APPEAL**—
Broad Selling Opportunities

LIST PRICES

SE18 — \$2.20 SE36 — \$3.00
SE24 — \$2.50 SE48 — \$3.50

**WHOLESALE S—There's
profit in our proposition!
Write for details!**

REFLECTORS, INC.

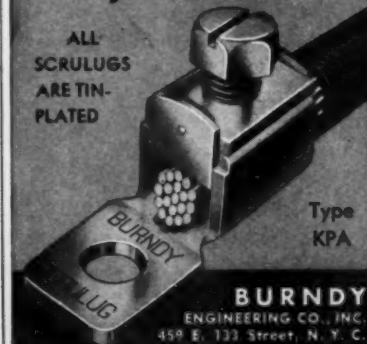
3225 Frankford Ave. Philadelphia, Pa.



Burndy SCRULLUGS

Have no loose joints
to get lost!

ALL
SCRULLUGS
ARE TIN-
PLATED



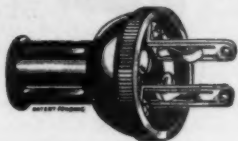
Type
KPA

BURNDY
ENGINEERING CO., INC.

459 E. 132 Street, N. Y. C.

Plug

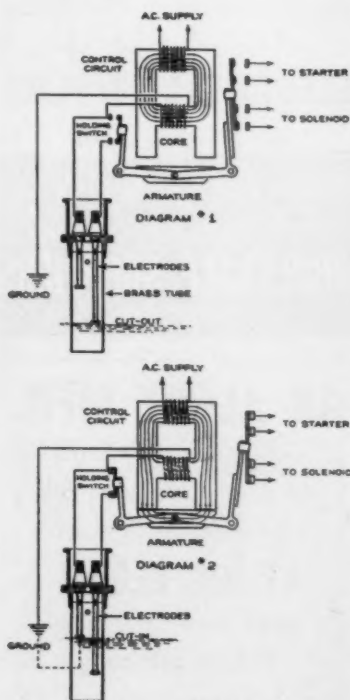
This improved line of Sta-Tite attachment plug has a new spring design. A bronze blade grips the receptacle, holding the plug secure. It prevents the plug from being disconnected by a slight pull, from falling out of worn or old receptacles; or plug blades from arcing and heating. The Sta-Tite Plug Company, 804 East 18th Street, Kansas City, Mo.



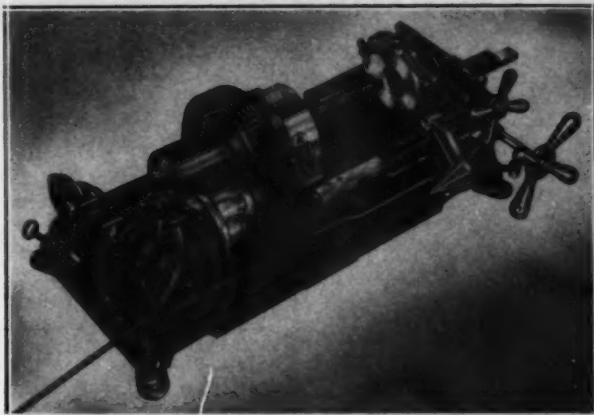
STA-TITE PLUG

Control for Liquid Levels

B/W induction relay switches for floatless control of conductive liquids. Control consists of electrically operated relay and two electrodes, suspended in the water. Rising and receding water level opens or closes circuit in relay. Some of the features are—no floats used or required; no moving parts in liquid; unaffected by pressures, temperatures, acids or caustics; variations in levels from 1/4-in. upward; can be installed in small space and on any type of tank; relay switch need not be near liquid. Diagrams show construction and operation. Bender Warrick Corp., Birmingham, Michigan.



BENDER WARRICK CONTROL SYSTEM



Big Brother to the Beaver Model-C

Beaver Model-B Pipe and Bolt Machine is the natural outgrowth of the popular Beaver Model-C Power Unit that converts hand tools into pipe machines up to 8-inch. Range of Model-B 1/4 to 2-inch; with geared tools and drive shaft up to 8-inch. Threads bolts 1/4 to 1 1/2-inch. Owners of Model-C Power Units can convert these units into Model-B Machines, at nominal cost. Model-B is light in weight (250 lbs.)—suitable for use on a bench, or with legs to form a stand. Available with or without oil pump.

FROM \$217.50 UP


Write for complete new bulletin-B—just off the press.

BEAVER PIPE TOOLS

1139 DEEN AVENUE

Quality Since 1900

WARREN, OHIO



*Correct Designs
in Chimes*

Beauty, harmony, and melody are combined in the authentic period designs of the new-styled line of Edwards door chimes now on display at your electrical wholesaler.

Write Dept. C-1 for your copy of the new full color chime catalog.

EDWARDS and COMPANY

CORWALK, CONNECTICUT

KNOB & TUBE WIRING



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ELECTRICAL WHOLESALERS

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KNOXVILLE, TENNESSEE, U.S.A.

Do you want YOUR SHARE of the Industrial Wiring and Motor Service and Repair Jobs During the



Coming
Months of
Increased Ac-
tivity?

Show customers
exact condition
of wiring or mo-
tors with the
MODEL "DM"
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MEGOHMMER

TRIPLE COLOR GRADING SCALE

As easy to use as a tube tester, and as easily understood by your project. It clarifies wiring as good, fair or doubtful. A scientifically accurate selling tool, to help you make more money.

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HERMAN H. STICHT & CO.
Dept. 53, 27 Park Place, New York
Send Bulletin C73

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Address
1139

EQUIPMENT News

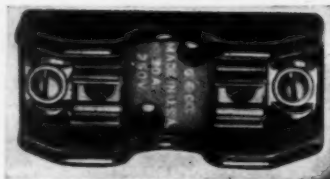
[FROM PAGE 101]

Ceiling Pull Switches

This complete line of bottom and side pull ceiling switches has black bakelite covers fastened to switch by one center screw. The line includes single pole, double pole, three way, four way and electrolier, also internal and back connected switches assembled to 3½-in. and 4-in. outlet box covers. Eight feet of heavy, duty black linen cord is supplied. Switches are rated up to 10 amperes, 125 volts; 5 amperes, 250 volts. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.



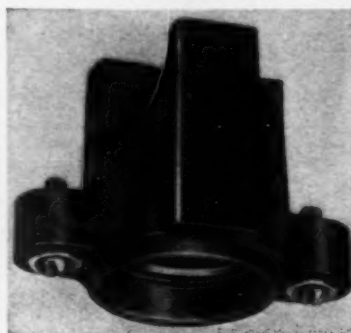
ARROW-HART &
HEGEMAN SWITCH



G-E. CUTOUT

Lampholder and Cutouts

Four new Textolite enclosed fuse cutouts and a lampholder for sign work have been developed to supersede four porcelain cut-outs and a lampholder in the present line. catalog numbers remaining the same. They are lighter in weight and have a higher resistance to breakage. Clips held firmly in place. Available in single pole main line with barriers; double pole main line; triple pole main line and triple pole main line solid neutral. Lampholder is designed for use in metal signs with binding screw terminals. It is keyless and rated at 660 watts, 250 volts. A 1½-in. hole in sign front is required for holder and a 1½-in. screw hole spacing. General Electric Co., Bridgeport, Conn.



G-E. LAMPHOLDER

PILOT LIGHTS NEON EXIT LIGHTS

WRITE FOR CATALOG ON
KIRKLAND BULLS-I-UNITS

Model #1800
Switchplate
Lamp. Mounts
on a single
gang box. Also
furnished with
outlet switchplate
for single hole
panel mount-
ing.



A real Lamp
in a Switch-
plate. Ideal
where modest
light and low
current con-
sumption is de-
sired. (3, 6, or
15 watt lamp).

Contractors everywhere are using Kirkland
Bulls-I-Units to build Lamp Annunciators.

Sold nationally by

THE GRAYBAR ELECTRIC CO.

The H. R. KIRKLAND CO., Morristown, N. J.

TEST-O-LITE

Tests Everything Electrical
From 100 to 550 Volts

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires, tells A.C. from D.C. Only Test-O-Lite, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also. List \$1.50 at leading jobbers.



L. S. BRACH
MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.

CO-OP MONTHLY

the Contractor's Net Price
Trade Catalog of
ELECTRICAL SUPPLIES

Sent to you on request

Co-Op Electric Supply Co.

812 W. Jackson Blvd., CHICAGO

WHOLESALE SUPPLIERS

SINCE 1915

AN ALERT MFR.

— has a copy of the
Directory of Electrical
Wholesalers

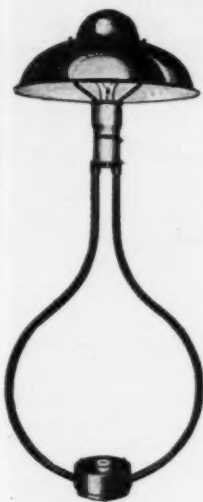
AT HIS ELBOW

— to save sales time
\$15.00 per copy

Wholesaler's Salesman, 330 W. 42 St., N. Y.

Pump Globe Adapter

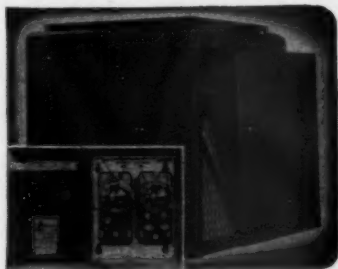
A new adapter for mounting Standlites on globe-fitted gasoline pumps. Tubular mounting bracket with concealed wiring attaches to collar of pump and provides a new standard 6-inch fitter for globe. Adapter may be supplied with switch so either globe or Standlite, or both, may be burned at same time. Top of adapter is fitted with a 2-inch pipe to take regular Standlite and lower section fits any size of globe up to 21 inches in diameter. Complete assembly is for concealed wiring and is weatherproof. Goodrich Electric Co., 2900 North Oakley Ave., Chicago, Ill.



GOODRICH
ADAPTER

Speed Control

A new Viking high-low conditioner with the new automatic speed control. By starting blower operation at low, heat is circulated much sooner and circulation period is doubled. When bonnet temperature of 165 degrees is reached, blower is automatically switched to high speed where it remains until temperature drops to 145 degrees. Blower then goes back to low speed until bonnet temperature falls to 120 degrees. Other features are weather-stripped filters; rubber blower mountings and insulation; high-low motor and self-adjusting motor base. Viking Air Conditioning Corp., Main and Center St., N. W., Cleveland, Ohio.



VIKING SPEED CONTROL

Badger

Synchronous ELECTRIC TIME SWITCHES



CONTRACTORS LIKE THEM BECAUSE:

they are dependable and easy to install

USERS LIKE THEM BECAUSE:

of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET
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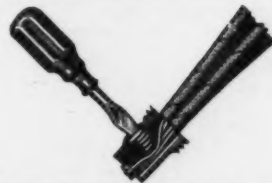
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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

(Of Electrical Contracting, published monthly at Albany, N. Y., for October 1, 1939.)

State of New York) ss.
 County of New York }

Before me, a Notary Public in and for the State and County aforesaid, personally appeared D. C. McGraw, who, having been duly sworn according to law, depose and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical Contracting, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Editor, Earl Whitehorse, 330 West 42nd St., N. Y. C. Managing Editor, None. Business Manager, Glenn Sutton, 330 West 42nd St., N. Y. C.

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D. C. McGRAW, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.
 Sworn to and subscribed before me this 25th day of September, 1939.

[SEAL]

H. E. BEIRNE,

Notary Public, Nassau County. Clk's No. 84. N. Y. Clk's No. 98, Reg. No. 0-B-90.
 (My commission expires March 20, 1940)

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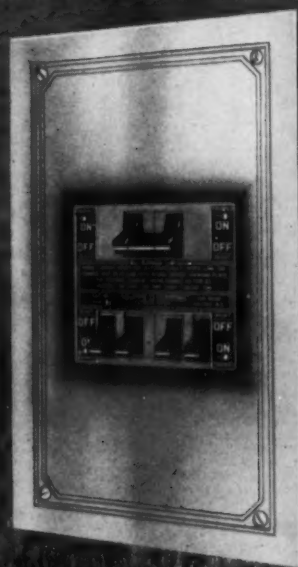
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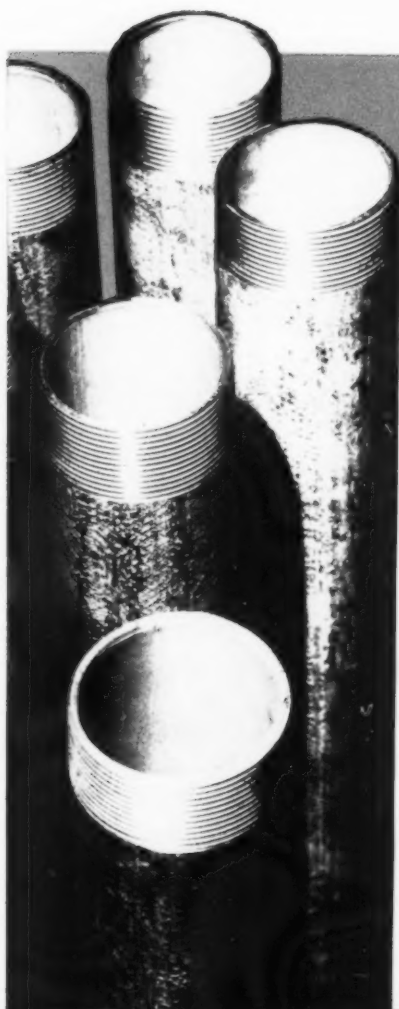


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